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DR. HALSTED

By

GEORGE W. HEUER

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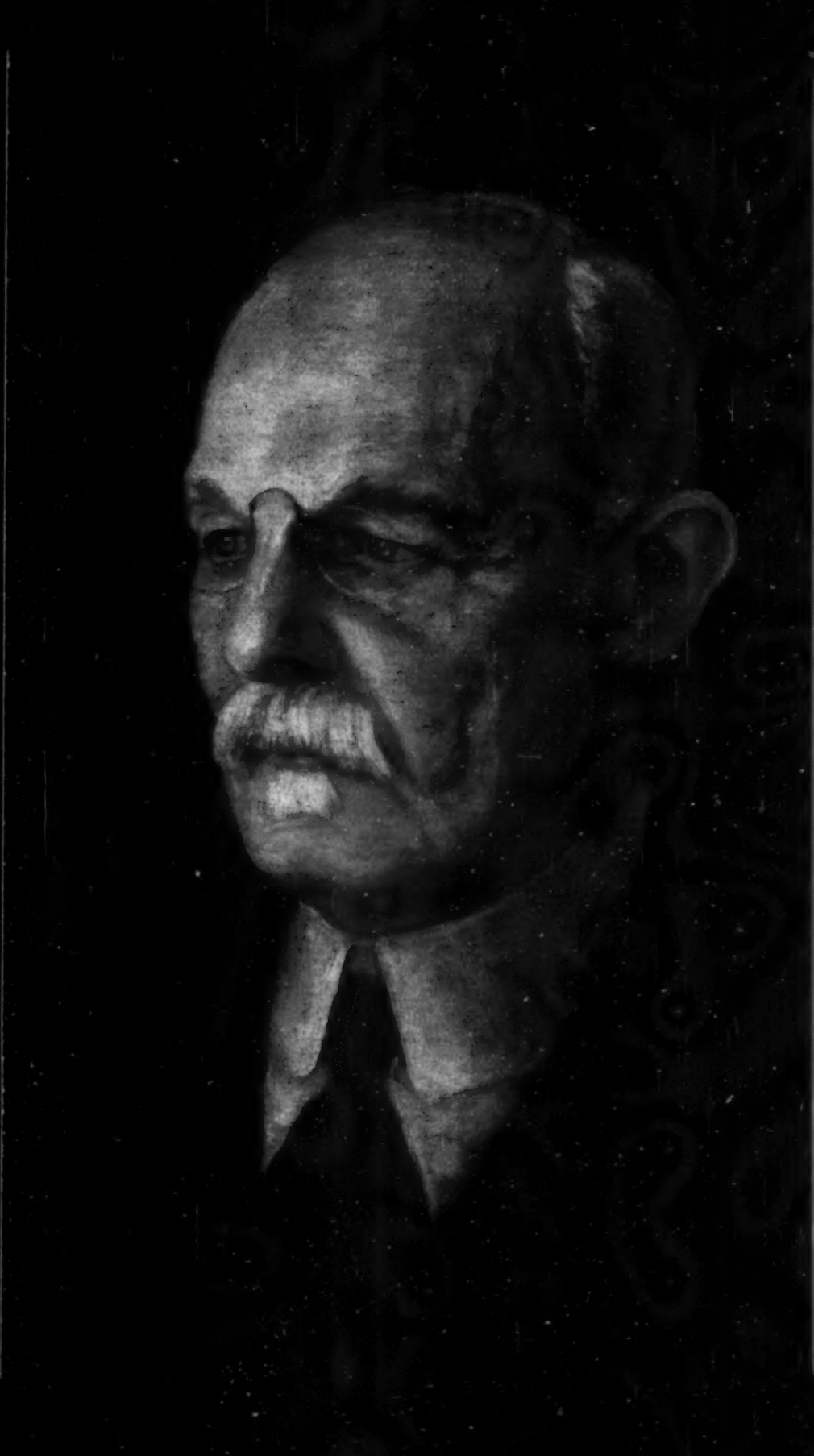

DR. DANDY'S FAVORITE PORTRAIT

OF

DR. HALSTED

BY HERMANN BECKER

Dr. Halsted

BY

GEORGE J. HEUER

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INTRODUCTION

In 1903, shortly after his graduation from the University of Wisconsin, George Julius Heuer began the study of medicine at The Johns Hopkins University School of Medicine. He graduated with honors in 1907, was appointed House Officer on the surgical service of The Johns Hopkins Hospital, and during the next four years was gradually advanced to the responsible position of Resident Surgeon. His diagnostic ability and technical skill at the operating table so completely won the admiration of Dr. Halsted, of the senior surgeons on the Visiting Staff, and of his associates on the House Staff that in 1914 he was made Associate Professor of Surgery of The Johns Hopkins University and Associate Surgeon of the Hospital.

During his seven years of postgraduate training on the surgical staff of The Johns Hopkins Hospital, Dr. Heuer became proficient in several branches of surgery including neurological, abdominal, and thoracic surgery. When Dr. Cushing moved to Harvard in 1912, Dr. Halsted asked Heuer to take over the neurosurgical work of the hospital in addition to his other duties in general surgery and in the Surgical Hunterian Laboratory. Just before World War I, Dr. Halsted arranged an exchange of assistants with the Professor of Surgery at the University of Breslau. Heuer was selected to go, and spent a year there at Küttner's Clinic. When the United States entered the war a unit was sent to France with Dr. Finney as chief of surgery; Heuer later headed the surgical side and did brilliant service there.

At the end of the war, Dr. Heuer resumed his duties at The Johns Hopkins Hospital and remained until 1922 when he accepted the chair of surgery at the University of Cincinnati. In 1931 he assumed the positions of Professor of Surgery at Cornell University Medical College and Surgeon-in-Chief at the New York Hospital.

As the charming informality of several portions of this manuscript reveals, Dr. Heuer and Dr. Halsted shared a very strong mutual affection. During the latter years of Dr. Halsted's life, Dr. Heuer and his right-hand man at Cincinnati, Dr. Mont Reid, often visited him at his summer home at High Hampton, North Carolina. During the last ten years Dr. Halsted was never very well. He tired easily and had symptoms of gall bladder disease, which became so severe during the summer of 1919 that he returned from High Hampton to Baltimore and underwent an operation by Dr. Follis for the removal of gallstones. He was reasonably well until August, 1922 when he had another severe attack while at his summer home at High Hampton. He telegraphed that he was on his way to Baltimore and asked that Doctors Heuer and Reid be summoned hurriedly from Cincinnati to operate on him. Despite the successful removal of common duct stones, his condition continued to decline and he died on September 7, 1922.

Dr. Heuer states in the foreword that this account was written partly at odd moments during a busy surgical life and partly during a period of greater leisure. Unfortunately this latter period was cut short by his untimely death and he did not have time to revise and edit the manuscript for publication. This work of love for both Dr. Halsted and Dr. Heuer was performed by Miss Margaret Boise, for many years Dr. Heuer's literary secretary, and Dr. Emile Holman, Dr. Halsted's last resident surgeon and now Professor of Surgery at Leland Stanford University. We are indebted to Dr. Holman not only for this but for his tireless efforts as Chairman of the Committee on Arrangements for the meeting in honor of the hundredth anniversary of the birth of Dr. Halsted. Furthermore, we wish to thank Mrs. Heuer and her children for permission to publish this manuscript in The Bulletin of the Johns Hopkins Hospital.

SAMUEL J. CROWE
ALFRED BLALOCK

FOREWORD

I frequently have been urged by friends of my own and of a younger generation to write a story of Dr. Halsted as I knew him. His reputation as a surgeon and as a teacher of surgery is steadily increasing, his contributions to surgery are being more widely appreciated, and his technical methods are being adopted by a growing number of surgical clinics. An excellent life of Halsted has been written by MacCallum, with an introduction by Halsted's most intimate friend, William H. Welch. A collection of Halsted's contributions to surgery, edited by Burket, has been published in two volumes by his associates and pupils. It contains an admirable and beautifully written appreciation of Halsted by his good friend, Rudolph Matas. These volumes on the life and works of Halsted have been read and, I feel sure, will continue to be read widely by physicians, surgeons and medical students. But in the minds of many they leave something to be desired. To an increasing number of surgeons, Halsted's contributions to the development of surgery grow in importance; and by not a few he is being recognized, as I believe him to be, as the greatest surgical philosopher this country has produced.

Scarcely a year has passed since the publication of MacCallum's Life that, at scientific meetings or social gatherings of surgeons, the desire has not been expressed for a more complete picture of the man. His many admirers, a great many of whom never knew or saw him but who appreciate his numerous contributions, would like to visualize him more completely: his appearance and general deportment; the organization of his surgical clinic; his conduct in the operating room and in the wards of the hospital; his relations with his staff, his colleagues on the faculty, his medical students and his patients; his methods of thought and work and teaching; his work in the experimental laboratory; and his life at home, at his club and in the country. It is assumed that, because I was associated with him for many years, I can create for them a picture of Halsted. But while I may be able to describe many of his traits and reveal him in the various activities which made up his life for some fifteen years, I know I shall fail to paint a complete portrait. For his was a complex personality. He was the despair of some with whom he came in almost daily contact. He was completely misunderstood by some of his distinguished colleagues in surgery and unappreciated by some of his own resident surgeons during the period they served him. His mere presence in the operating room when they were at work caused some of his associates acute discomfort. Others seemed comfortable and welcomed his suggestions. He shriveled some with his biting sarcasm, was patient with the faults of others. Few of his staff were at ease in his presence. He never failed to command respect. He won the admiration, love and affection of those he taught but these feelings, because of his own re-

moteness, they were never able to show or express. To his intimate friends he was a keen, witty, delightful companion; to others shy, reserved and retiring. To me he was a second father, wise in counsel, considerate of my shortcomings, patient with my stupidity, understanding in my surgical misfortunes. It would be impossible for me to write of him other than sympathetically, yet I shall try honestly to describe all sides of his nature as I saw them over a period of fifteen years. It has not been an easy task. Fully do I appreciate how he would shrink from any exposure of the details of his life. But because of his position in the development of surgery in this country, his life should, in the considered judgement of many, become more generally known. Welch, in his introduction to MacCallum's Life of Halsted, states that the author has left us a truthful picture of the man as he revealed himself to the world. I am still debating, after some years of reflection, how far I may properly go in portraying my chief as he revealed himself to one of his pupils.

The present little volume does not pretend to be a complete biography. Only so much of Halsted's early life is given as to provide a background for his later career. Only a fragment of his life in Baltimore is covered and that incompletely. Rather this volume is the result of the insistence of friends that I put down my recollections of Dr. Halsted before something happens to me. It has been written partly at odd moments during a busy surgical life, partly during a period of greater leisure. For the devoted help of my secretary, Margaret Boise, I am indeed grateful.

I. FAMILY, BOYHOOD, COLLEGE LIFE, AND EARLY MEDICAL WORK

In a study of Dr. Halsted's ancestry MacCallum found that his family can be traced back to the sixteenth century in England, where it occupied an estate in Rowley Parish called High Halsted. The first immigrants to this country, were two brothers, one of whom, Timothy Halsted, settled as a land owner at Hempstead, Long Island, in 1660, but moved in early days to Elizabethtown, New Jersey. Very little can be learned about the family excepting that one of them, Robert Halsted, was a doctor, who during the Revolutionary War was imprisoned by the British because of his political beliefs and activities. One of Timothy Halsted's sons was William Mills Halsted who, after being associated with the firm of Van Gesen and Van Blarcom in New York, founded the firm of Halsted, Haines and Company, wholesale importers of dry goods. The firm was successful and its members became prosperous. Aside from his prominence in the business world, William Mills Halsted became well known because of his interest in various philanthropic activities. He was a founder of Union Theological Seminary and of the American Bible and Tract Society, an elder in the University Place Presbyterian Church, and a Governor of the New York Hospital and of Bloomingdale Asylum, now the Westchester Division of the New York Hospital. He built a large square three-story house on the northwest corner of Fifth Avenue and Fourteenth Street and subsequently three adjoining houses for his children. Two of his sons are of immediate interest in this account. One, Thaddeus Mills Halsted, was a doctor in New York and became attending surgeon to the New York Hospital, then located at Broadway and Pearl Streets. Among his contributions is a paper on pulsating thyroid tumors. The other, William Mills Halsted, Jr., after graduating from Williams College in 1846, followed his father in business and became the head of the firm of Halsted, Haines and Company. He married his cousin, Mary Louisa Haines, daughter of Richard Townley Haines, and of this marriage four children were born, William Stewart, the subject of this volume, Bertha, later Mrs. John T. Terry, Minnie, later Mrs. S. O. Vander Poel, and Richard. He also became an influential citizen of New York, was a member of the Board of Trustees of the College of the City of New York and of the College of Physicians and Surgeons, New York, and trustee of various charitable institutions. He was the founder of the Commonwealth Fire Insurance Company.

William Stewart Halsted was born in New York on September 23, 1852. Of his early life very little is recorded. It certainly was surrounded with all the luxury of the period. The wealthy family had a town house in New York and a country home at Irvington where his father, interested in flowers, had extensive hothouses for their cultivation. Yet from comments available one

can imagine life for the boy was at times restricted and irksome, for his father adhered to the Presbyterian code of morals of that day and frequently exercised his parental authority upon him.

Dr. Halsted himself, in answer to a request from Dr. Welch, has furnished some details of his early life. From his letter to Welch it appears that during the first ten years he was taught at home by governesses. In the fall of 1862 he was sent to a private school in Monson, Massachusetts, conducted by the Reverend Mr. Tufts, a retired Congregational minister. There were about twenty boys in the school, all much older than young Halsted. He recalls little of the method or the scope of instruction in the school but he clearly remembers Sundays, for he relates that he spent the entire day in the churchyard. Sunday School was held from 9 to 10 or 10.30; church till 1 p.m.; luncheon from a basket; Sunday School again at 3 p.m., and church service from 4 to 5.30 p.m. The life proved too much for him, and in the spring of 1863 he attempted to escape from the school, walking to Palmer, four miles away, and there taking the train to Springfield, a distance of twenty miles. There he was captured and brought back to Monson. What he planned to do in the event of a successful escape he does not say.

He went to Andover in the fall of 1863 and graduated in 1869. He has nothing to say of this period and the records at Andover fail to reveal his abilities as a student or his extra curricular activities. He was considered too young to go to college and was placed in a private day school in New York for one year; he also had a tutor for three or four months who coached him in Latin and Greek just before his entrance examinations for college.

He entered Yale without conditions in 1870 and graduated in 1874. He states that during this period he devoted himself solely to athletics. His classmates agree that he could easily have stood in the first division of his class, but he did not study and made, on the whole, a poor scholastic record. In his freshman year he was a member of Delta Kappa and of a freshman eating club, the Tasters. In his sophomore year he was a member of Phi Theta Psi and of a committee of eleven for the class supper of 1874. In his junior year he was a member of Psi Upsilon. During this year he was on the class crew in the barge race in the fall regatta on Lake Saltonstall, shortstop on the class baseball nine, and one of twenty performers in the Yale gymnastic exhibition for the benefit of the Yale navy. In his senior year he was on the class crew in the barge race, captain of the football team, and one of seven members of the '74 French Club. He excelled in football and was captain of the team that played against Columbia November 16, 1873. He was interested in boxing and wrestling, went to prize fights and wrestling matches, and I am told that he attended such contests even after he came to Baltimore. He learned parts in plays quickly and is said to have acted very well, mostly in humorous parts. He was a good dancer but is said not to have gone in for social activities. He did not drink. He is

described during his college days as rather slight but well built and exceptionally strong and, even at that time, careful in matters of dress. He was generally popular with the student body and socially minded, but gave no evidence of unusual ability or of great ambition.

The autumn after his graduation from Yale in 1874 he entered the College of Physicians and Surgeons. While still at Yale he had shown some interest in medicine for he writes that in his senior year he purchased Gray's Anatomy and Dalton's Physiology, studied them with interest and attended a few clinics at the Yale Medical School. At the College of Physicians and Surgeons he registered with Dr. Henry B. Sands as preceptor, Dr. Sands being then Professor of Anatomy but was also active as a surgeon. As a student he became third, then second and finally first assistant to Dr. John C. Dalton, Professor of Physiology, but most of his time was spent in dissection. During his second winter he made some clinical tests in the office of Alonzo Clark, who at the time, was President of the college, Professor of Pathology and of the Practice of Medicine, and a leading consultant in New York. Through the summer of 1875 he worked in the pharmacy of the Centre Street Dispensary under a Danish pharmacist, Boege, who instructed him in making plasters, pills, elixirs and tinctures. He knew Dr. Thomas A. McBride, physician-in-chief to the dispensary, who was an inspiration to the young medical student.

In the early summer of 1876 Dr. Halsted was, according to his own statement, run down in health and went to Block Island to recuperate. He devoted his mornings and evenings to study, his afternoons to sailing and fishing. On returning to New York in the autumn he decided to take the examinations for intern at Bellevue Hospital although a ruling had just been made that only graduates in medicine were eligible, nor had he taken cram quiz courses which at the time were given in New York by various men and which were deemed necessary in order to obtain hospital appointments. In spite of all this he made fifth place and selected the fourth surgical division at Bellevue, although he states that he would have preferred the second surgical division of which Thomas A. Sabine was the visiting surgeon.

As an intern at Bellevue Hospital he followed the medical work with as much interest as the surgical, making rounds with E. G. Janeway and A. L. Loomis and spending a good deal of time in the medical wards and in attending autopsies. He assisted Jacobi in his surgical operations which he describes as very amusing. Much of the surgery we would now designate as minor.

During the period from October 1, 1876, to May 1, 1877, 95 patients were admitted to this service on which Dr. Halsted was an intern. An analysis of the conditions for which these patients were admitted shows that 50 were simple fractures or dislocations, 4 were compound fractures, 8 gunshot, pistol or stab wounds, 10 other wounds, burns or frostbite, 8 urological conditions, 2 skull fractures, 2 synovitis of the knee joint, 4 simple rectal conditions, and

one painful amputation stump and one cancer of the breast. The last was treated by simple mastectomy.

It was at about this time that Lister visited this country and his antiseptic technique had been enthusiastically adopted by Stephen Smith and Sabine of the Second Surgical Division, but not by other surgeons at Bellevue. Dr. Halsted thus had the opportunity of comparing the results obtained with and without Lister's methods, and these he states were strikingly in favor of the former. Of his own work at the time he speaks of the measurement of several hundred legs, done with Dr. George Munroe, in which they found that the left was usually longer than the right; of the use of the hot bath in the treatment of infections, his most important contribution at this time; of a sliding apparatus to be used with Buck's extension in the treatment of fractures of the hip; of a method of treating fractures of the patella without operation; and of methods of traction and countertraction in the treatment of fractures of the femur. Among the men at Bellevue from whom he learned a great deal was Frank Hamilton, whom he describes as coming to the hospital on a large iron-gray charger with riding boots and spurs. The two became great friends, and Halsted notes that in their many conversations Hamilton constantly stressed the satisfaction which original work would give.

In the spring of 1877 Dr. Halsted took the examination for his M.D. degree in which he stood among the first ten men. They were invited to compete in a written examination for a prize of $100.00 which he won. In the late winter of 1877 an announcement was made that an examination would be held the following spring for the position of house physician to the New York Hospital and Dr. Halsted was urged by Dr. William H. Draper to compete for the position. This he did and won it; and for a period of eight months he served on the medical wards, Dr. Amidon being his first assistant.

In reading the old records of Bellevue and the New York Hospital during the period 1877 to 1884, one discovers not only the kind of conditions for which patients were admitted but the surgical techniques employed. It was a transition period. Lister had developed and announced his antiseptic method but few New York surgeons understood and used it. Dr. Halsted's own comment on the surgical technique of the time may serve to illustrate the conditions then prevalent. In a discussion of Dr. Thomas M. Markoe's paper he said he thought it would be difficult in a given case to determine the exact cause of a bad result considering the imperfect antiseptic technique existing even in the best New York hospitals. Trained nurses with long sleeves and uninspected hands were allowed to pass and hold dry sponges. He repeatedly observed ligatures handed to the operator from the mouth of the intern, and he seldom found instruments, especially artery clamps, which had been sufficiently cleaned. He observed further that in some hospitals the preparation of the catgut was entrusted to the apothecary, and even if prepared by the intern was not guaranteed to be properly, even conscientiously, done.

Under such conditions postoperative infection was common and the mortality high. One can understand the surgeon's willingness to attempt only such operations, particularly major operations, as seemed likely to save life. In the treatment of compound fractures, the life of the patient was frequently saved only by amputation. In a few cases the history notes refer to the use of Lister's antiseptic technique. A bursal tumor of the knee was operated upon with the use of the Lister spray, ligatures and sutures soaked in carbolized oil, and carbolized dressings. A case of perineal resection of the rectum was dressed every four hours under the carbolic spray, but despite the good state of the perineal wound peritonitis developed and the patient died. Mention is made in other cases of the use of silk soaked in carbolized oil as a ligature and as suture material and of silver wire sutures to bring the edges of the wound together.

While conditions were unfavorable for major surgery, no better example of the courage and resourcefulness of the New York Hospital surgeons at this period can be given than their deliberate attack upon aneurysms of the great arteries of the body in an attempt to cure a disease almost invariably fatal. Valentine Mott, many years previously, had successfully cured an aneurysm of the innominate artery. The operation at this time consisted of the ligation of the vessels with heavy silk; the ligatures were left long, brought out through the wound, and after a time encouraged to come away by elastic traction. Some degree of infection was frequent and postoperative hemorrhage was not uncommon. The mortality was high but an occasional success was recorded. It is probable that Dr. Halsted's intense interest in the surgery of the major blood vessels which he retained throughout his life and which led to many experimental and clinical contributions to the subject, dates from this period.

In the hospital records at the time there are occasional amusing notes indicating a certain informality in the operating room. The description of an operation for varicocele performed by Dr. R. F. Weir, a famous surgeon of the day in New York, begins: "Patient operated upon in a standing position, the operating table being at the time occupied by another patient."

This brief and very incomplete summary of the records of the New York Hospital and Bellevue suggests the opportunities offered a young surgeon with good training and an investigative turn of mind to make important contributions to surgery. Here was the whole field of surgical technique awaiting development; here were unlimited opportunities to devise safe curative operations for specific diseases not only upon the surface of the body but within its various cavities; here was the field of anesthesiology to be extended and perfected. Here also was the opportunity to teach and encourage young men to participate in these developments.

Dr. Halsted's chief contribution during this period was a new design for the temperature charts of the hospital histories. They are in use at the New York Hospital today and were later adopted by the Johns Hopkins Hospital and many other institutions. It was about this time (summer of 1878) that Dr.

Halsted became acquainted with Dr. Welch who was so greatly to influence his life.

This date may be said to end the early period of Dr. Halsted's life in medicine. The record which Dr. Halsted himself has set down seems rather scanty; but physicians, medical students and laymen who read it should remember that medical colleges and their medical curricula were greatly different from similar institutions today. Dr. A. P. Stout who in 1924 read a paper before the Halsted Club on the early New York period of Dr. Halsted's life, gives a good idea of undergraduate medical education as it was at the old College of Physicians and Surgeons. I quote the following from his paper: "The catalogue states that Candidates for the degree of Doctor of Medicine must have attended two full courses of lectures—the latter in this college. They must have studied medicine three years under a regular physician or surgeon; have attained the age of 21 years and be of good moral character. They have also to write a thesis and pass a satisfactory examination before the college faculty on the seven branches of medical sciences taught in the lectures. These were anatomy, physiology and hygiene, chemistry and medical jurisprudence, materia medica and therapeutics, obstetrics and diseases of women and children, surgery, pathology and practical medicine. Attendance upon these didactic lectures was compulsory and examinations were based upon them. There were also clinics held at many of the hospitals about the city but attendance at these was optional.

"This college work, however, was more or less a farce. No student expected to get more than his M.D. degree from the medical school—he got his real training from two sources: his preceptor and the private quiz. Every student had to be registered with a preceptor who was a regular physician or surgeon. This practically amounted to an apprenticeship system and naturally much depended upon the ability of the preceptor as a teacher and inspirer—and the young graduate's future might be assured if his preceptor was a person of influence.

"The private quiz was a peculiar institution and took the place of the conferences and quizzes which exist today in the medical school itself. From three to six doctors would associate themselves under the leadership of the most prominent member and invite the medical students to recite to them from memory the various subjects which they studied. They covered pretty much all the subjects contained in the curriculum. It really amounted to an exploitation of the medical students, for the quiz masters were usually faculty members and we have the strange picture of the faculty members of an institution advising their students not to pay any attention to the curriculum but to go outside to a private quiz—and usually the faculty member who gave the advice was running a private quiz himself.

"Medical education was expensive even then for a student—he paid annually $140.00 for his lectures, $100.00 for the private quiz, beside matriculation fees and incidentals."

II. STUDIES ABROAD

In the fall of 1878 Dr. Halsted sailed for Europe. He was met in Paris by his friend Sam Vander Poel, and after twenty-four hours there they took a train for Vienna, arriving November 4th. In Vienna he began the study of German, taking two lessons daily from two teachers, one lesson being given before breakfast. He attended courses in pathology with Chiari, in diseases of the eye with Fuchs and Arlt, in diseases of the ear with Politzer and Gruber, in diseases of the skin with Kaposi and Neumann, and in diseases of women with Pawlik. But the study of anatomy under Zuckerkandl and Holl was his chief interest and to this subject he devoted the greatest amount of time. In addition he attended the surgical clinics of Billroth and Braun and, for a short time, the lectures of Meynert. He persuaded Meynert to give him a private course in the dissection of the brain, and as six o'clock in the morning seemed the only available hour, agreed to it; but he always found Meynert in bed on his arrival and as the course was given in Meynert's "unsavory" bedroom he gave it up. He studied embryology with Schenck which led to friendly relations with Woelfler and Mikulicz, the former being first assistant to Billroth. Woelfler gave him unrestricted entree into the surgical wards and Billroth's operating amphitheater. He was chiefly impressed by the magnitude of the operations performed, by the surgical skill of Billroth and his assistants, particularly Mikulicz, and by the great number of artery forceps used. At the time, Billroth had not yet performed his first resection of the stomach and Dr. Halsted does not recall seeing an operation for goiter, operations for which Billroth later was to become famous.

Also while in Vienna he began Exner's course in histology but had no time to continue it. By the end of the first academic year he was on very friendly terms with Holl, Professor Lange's second assistant, afterwards Professor of Anatomy in Graz. Throughout the second winter they worked together many evenings on the anatomy and comparative anatomy of the brain, using Schwalbe as their chief textbook. This work, he states, proved useful a few years later in New York when he was unexpectedly called upon during Sabine's illness to take his place at the college. He gave thirteen lectures on the anatomy and embryology of the brain and spinal cord, a subject which in his day in medical school was covered in one brilliant lecture by Sands.

In the spring of 1879 Dr. Halsted left Vienna for Würzburg to take a course in embryology with Kölliker and in histology with Stoehr. He attended regularly the surgical clinics of von Bergmann, another famous German surgeon. His stay in Würzburg, however, was shortened by the arrival of his parents and sisters with whom he and Sam Vander Poel travelled about during the summer, Vander Poel being engaged to Dr. Halsted's sister Minnie.

He returned to Vienna in the autumn of 1879 and was joined there by Drs. George Dixon and McPhail. He and Dixon roomed together in an apartment

occupied by a widowed mother and her two daughters with whom they took their suppers in order to improve their German conversation. He says little regarding his work during this second winter except to state that in some ways it was more profitable than his first, not only because he understood the language better but because he had become better acquainted with his teachers. He remarks that Dixon's attractiveness involved them in many social activities. During the Easter vacation they went to Italy for ten days and Dixon made conquests all along the route.

Soon after the Easter holidays (spring of 1880) he deserted his "gay friends" and left Vienna for Leipzig. There he was cordially received by Weigert under whom Dr. Welch had just previously worked. He studied tumors with Huber, but they proved uninteresting to him without accompanying patients or clinical histories. He made, however, a collection of slides of the tumor material which he brought home with him. He attended and enjoyed the surgical clinics of Thiersch but notes that his operations were mostly minor ones. His stay in Leipzig was not as profitable as he had hoped because soon after his arrival there came a telegram from McPhail and then McPhail himself, ill with typhoid fever which he had contracted in Rome. His concern over McPhail's illness interfered with his work. Dixon arrived and with his coming and McPhail's improvement he left Leipzig for Halle.

At Halle he spent several profitable weeks with Volkmann. He then went to Berlin and to Hamburg where he saw Schede and to Kiel where Esmarch was active. After that he returned home via Paris and London, arriving in New York early in September 1880.

The two years from autumn 1878 to autumn 1880 may be considered as a second phase of Dr. Halsted's preparation for a career in surgery. The first phase—his undergraduate medical education and his internships in Bellevue and the New York Hospital—gave him a relatively narrow outlook on the medicine of the period. But his experiences abroad not only increased greatly his own knowledge of medicine but also provided a strong stimulus for his future activities. By an accident of birth he was at just the right age to witness and to participate in the revolutionary advances which were at the time occurring in many different fields of medicine. Bacteriology was a new, active science. Antiseptic surgery was developing here more rapidly than in any other country. Embryology and histology were making great strides and pathological anatomy was being studied from new viewpoints and with better understanding. It was a period of enormous importance in the subsequent development of medicine and surgery. It was also the period of German supremacy in medicine and its related subjects, and Germany and Austria had become the Mecca which drew students from all over the world to study under their great leaders. The surgeons whom Dr. Halsted saw and under whom he worked—Billroth, Woelfler, Mikulicz, von Bergmann, Thiersch, Volkmann, Schede, Esmarch—are among

the great names of surgery for this period, and will remain unforgotten in the annals of surgery. Volkmann, of them all, was most responsible for the introduction and development of antiseptic surgery in Germany and must have been an inspiration to Halsted. Kölliker and Stoehr in histology, Chiari and Weigert in pathology, Fuchs and Politzer in diseases of the eye and ear, and Zuckerkandl and Holl in anatomy, were all prominent in their respective fields. As I look around my shelves in writing this the textbooks of many of these men are present, for they were among the books recommended to us when I was a medical student twenty-five years after the period we are considering. A summary of the contributions to medicine and its preclinical subjects made by the men under whom Dr. Halsted studied would be of great interest.

III. RETURN TO NEW YORK. LIFE AND ACTIVITIES THERE

Of Dr. Halsted's life and activities in New York after his return from Europe in September, 1880, we again wish for more sources of information. There are, however, his own letters to Dr. Welch; the recollections of those of his contemporaries who knew him, particularly Dr. George Woolsey and Dr. Ellsworth Eliot; the records of the hospitals in which he was active, and the publications of this period. From these may be pieced together a picture—perhaps somewhat incomplete—of the sort of man he was at this time, of his social activities and of his prodigious work as a young surgeon.

On his return to New York Dr. Sands urged him to become his associate at Roosevelt Hospital where he had, through the resignation of Dr. Weir, a continuous service. Dr. Sands permitted him to operate upon cases which interested him and to organize and dictate the technique of the clinic. He was early entrusted with the purchase of instruments as a part of his duties and in one order to Europe he listed twelve artery forceps. "What shall we do with so many?" was Dr. Sands' amused question. In later years when 250 forceps would be applied in a single breast operation for the control of hemorrhage, he often referred to his earlier New York experience and said that no hospital had more than six artery forceps at one time. In Germany he had been greatly impressed with the number of forceps used in Billroth's clinic, and perhaps it was his experience there which showed him the necessity of controlling hemorrhage in major operations which were then being developed.

He proposed to start an outpatient department at Roosevelt Hospital and in this he had the warm support of Dr. Sands. A basement of the hospital, provided with water and gas, was placed at his disposal; and here in the autumn of 1880 or early spring of 1881 he started the work in the dispensary. He had as his associates Drs. Hall, Frank Hartley and Frank Markoe, and together they were active in the outpatient department every morning including Sun-

day. Sunday was devoted to the treatment of gonococcal infections, and they studied the effect upon this disease of various weak solutions of bichloride of mercury injected into the urethra. The results obtained by this method were remarkably good and the work was a distinct contribution to the subject. Dr. George E. Brewer soon joined the group in the Roosevelt Dispensary, participated in the work and later, in 1887, described the method and the results of treatment in a paper entitled "Modern Treatment of Urethritis." It is interesting to note that in studying the effect of treatment Dr. Halsted and his associates not only were concerned with the improvement of symptoms but counted the gonococci in the urethral smear from day to day with the microscope. The determination of the number of organisms in a microscopic field as an index of the increase or diminution of an infection was, therefore, known to this group, but who originated it I have not been able to determine. Certainly it was not commonly known, for in my earlier days at the Johns Hopkins Hospital we did not make use of it, nor did I hear of its being employed in other clinics. It was rediscovered during the World War of 1914–1918 when, together with bacteriological culture, it became part of the technique of the Carrel-Dakin treatment so widely applied to wounds of war and to infected wounds of civil life.

The trustees of the Roosevelt Hospital were convinced of the value of the outpatient work, and about a year after Dr. Halsted had organized the clinic they erected a suitable building with provision also for a medical department of which Dr. West Roosevelt was placed in charge. Dr. Halsted boasted that he had not missed a day from dispensary duty from the time he originated the outpatient department until the spring of 1884 when he went to Europe to attend a Congress of the Deutsche Gesellschaft für Chirurgie.

At this meeting Volkmann greeted him warmly and nominated him for memberhsip in the society; von Langenbeck, another distinguished German surgeon, seconded the nomination. This was a great distinction, for few American surgeons have ever been elected to this society and he was, at the time, only 32 years of age. Dr. Halsted, always interested in people's appearance and dress, describes Volkmann in a letter to Welch: "Volkmann was tall, slender and animated, had reddish hair and wore flowing Dundreary whiskers and long mustaches. His costume at the first séance of the Congress I recall vividly—swallow-tailed coat, white silk waistcoat, bespangled with embroidered flowers, soft white shirt, flowing bright red artists' tie and Scotch plaid trousers. He was a forceful, logical and picturesque speaker—a genius and also, as you know, a poet."

In addition to the organization and development of the new Roosevelt Dispensary and his work in the department of anatomy of the College of Physicians and Surgeons, Dr. Halsted organized a "quiz" which was conceived on a plan different from that of the cramming quizzes so long popular in New York.

It began with the opening of school in the fall of 1880, and in addition to Dr. Halsted, who taught anatomy and surgery, there were associated with him William H. Flint who taught physiology, and Dr. Munroe who taught the practice of medicine, materia medica and gynecology. Dr. Halsted and his associates accepted for instruction only students with college degrees and eventually had about sixty-five men in the quiz, almost all the students in the College of Physicians and Surgeons who had an A.B. degree. The students were taken daily to the hospitals and dispensaries and had recitations regularly. They were given a laboratory course in chemistry at Columbia by "Tim Cheesman's brother," a laboratory course in physiology, and a laboratory course in histology and pathology by Dr. Welch at Bellevue. On graduation from the college, Dr. Halsted notes, these men invariably carried off the honors. "In the first twelve we usually had as many as ten." Very few of these men attended the lectures of the college in which they were matriculated, evidently finding the instruction they received in the quiz more satisfactory.

This quiz went along satisfactorily for three years (1880–1883). Dr. Halsted then left the group and joined or founded another which included Drs. George Tuttle, West Roosevelt, William G. Thompson and Charles Pellew. This became even more famous than the first, and continued from 1883 to 1886 when Dr. Halsted decided to go to Baltimore. The original group with Dr. Munroe and Dr. Flint continued for several years after his separation from it. After they gave it up Dr. Ellsworth Eliot, one of the group, started his own quiz and continued it successfully for years.

The quiz organized by Dr. Halsted differed strikingly from those previously conducted in New York. It was not, as they were, cramming quizzes in which men learned certain information in required textbooks for the sole purpose of successfully passing the examinations at the college and the hospital examinations for internship. Rather it was a medical course including practical preclinical work in the wards and outpatient departments of hospitals. It was indeed another medical school outside the College of Physicians and Surgeons; and that it successfully competed with it is indicated by the fact that it drew almost all the men with college degrees, who then largely abandoned the lectures of the college.

There is certain information concerning Dr. Halsted which serves to draw a picture of him at this time in contrast with that of his later years. "Those who knew Halsted remember him chiefly as a bold, daring and original surgeon, an indefatigable worker and, most of all, as an inspiring teacher" (Purdy). He taught anatomy at the medical school, anatomy and surgery in his private quiz, and surgery Sunday mornings at Roosevelt Dispensary. Dr. Sam Lambert remembers him as "of moderate height, a slight figure with a beard and prominent ears." Hotchkiss writes: "I remember him distinctly as a demonstrator of anatomy, seeing him walk through the dissecting room, distributing the parts

and helping the students with their work. He appeared tall, slim, very bald and very near-sighted." Ellsworth Eliot says: "He was accustomed to make hurried rounds (in the dissecting room) in his shirt sleeves and wearing a high hat." It was in his private quiz that he made the deepest impression on his students. Dr. Thomas Southworth, a student in 1884, says: "Dr. Halsted was an ideal teacher and absolutely at home in his familiarity with his subject and with Gray's Anatomy." He relates that the students at times tried to trip him on some point in anatomy and found it very difficult to do so. The students took an immense pride in their quiz and its teachers. Dr. Hotchkiss says: "He was always ready to help the boys with their work and was very pleasant with them, using on occasion his well known little ironic method with which we were all familiar in our student days and which served to keep perfect order in his quiz classes. He held a wonderful quiz in anatomy at his offices where he had a large number of anatomical preparations both dry and wet, notably a splendid collection of brains hardened in alcohol and sectioned for study. He required his men to carry anatomy through three years of the college course, regarding it of great importance." Dr. Ellsworth Eliot says: "He was an omnivorous reader, an unusually close student of surgery and an excellent anatomist. He was highly regarded by his individual students although he had the habit of spending an entire hour on some trifling part of the subject lesson." This last has a familiar sound; for I heard our students at the Hopkins many years later complain similarly. But the trifling part of the subject lesson was their conception of it; to Dr. Halsted it was an important part of an interesting problem.

In addition to the activities I have described, Dr. Halsted enormously increased his work through the appointments he received on the staffs of many New York hospitals. In 1881 or 1882 he was appointed physician to the Charity Hospital on Blackwell's Island and the next year became Surgeon-in-Chief to the Emigrant Hospital on Ward's Island. He writes that his visits to the Charity Hospital and Ward's Island had usually to be made at night for his days were completely occupied. The Ward's Island service was splendid; and it appears that the interns at the Charity Hospital saved the operations for him, calling them night emergencies. He was Assistant Attending Surgeon to the Roosevelt Hospital and later Attending Surgeon. He was appointed Visiting Surgeon to Bellevue Hospital in 1884 and there, finding it impossible to carry out the proper technique in the operating rooms, he petitioned the Commissioners of Charity and Correction for permission to erect in the hospital enclosure an operating pavilion for his sole use. This the Commissioners could not do, but permitted the erection of a tent costing $10,000.00, to which George Dodge and Dr. Halsted's brother contributed and which his friend Steub, a church architect, designed and of which he supervised the construction. Dr. Halsted described it as a beautiful tent, the floor of maple laid almost as finely as a bowling alley, provided with many large portholes to assure ample light

and supplied with hot and cold water and gas. It served the purpose of an operating room admirably but was not long in use, for Dr. Halsted left New York soon after its completion. About the same time, 1883, he was appointed to the visiting staff of the Presbyterian Hospital just after the great upheaval when all the surgeons except Stimson and Briddon resigned. The surgical staff was thus reduced to three. He and Stimson, good friends before, became warm friends and continued so. Briddon received him cordially but a difficulty arose because he wished to assist at all of Dr. Halsted's operations. This difficulty was soon corrected. In addition, Dr. Halsted had the summer service at the Chambers Street Hospital thanks to the kindness of William T. Bull, who was Surgeon-in-Chief. The traumatic surgery there was very heavy both day and night. It was at the Chambers Street Hospital that Dr. Halsted made his experiments on "refusion of blood." There were many cases of illuminating gas poisoning, chiefly from the night boats on the Sound and Hudson River; and Dr. Halsted conceived the idea of bleeding the patient, agitating the blood with air so as to remove from it the poisonous carbon monoxide, and reinjecting the blood into an artery. This reintroduction of aerated, defibrinated and detoxified blood into the arteries of an individual from whom the poisoned blood had been withdrawn was the first experiment of the kind carried out in the human subject and had an important bearing on the development of the whole subject of blood transfusion, which today is so commonly practiced. Moreover, Dr. Halsted at about this time practiced blood transfusion as we use it today. In 1881 he arrived by chance in Albany when his sister, after the birth of her first child, suffered a great postpartum hemorrhage. He was summoned to her bedside and found her ghastly white, pulseless and almost unconscious. "After checking the hemorrhage, I transfused my sister with blood drawn into a syringe from one of my veins and injected immediately into one of hers. This was taking a great risk but she was so nearly moribund that I ventured it and with prompt result." The quotation is from Dr. Halsted's letter written in 1922. Rightly he states that it was "taking a great risk," but I doubt whether he could have known the real risks at that time, for nothing then was known of the incompatibility of bloods, of blood groupings, and so on. Yet it was, as far as I can determine, the first instance of successful direct blood transfusion by the syringe method—a method later developed by one of his interns, Hans Lisser. Another instance of his courage and skill concerns his own mother, who in 1882 was very ill, under the care of Dr. McBride, and had been seen in consultation by Janeway, Sands, Delafield and Draper. He found her slightly jaundiced with "tumefaction and great tenderness in the region of the gallbladder. . . . So at 2 a.m. I operated, incised the gallbladder which was distended with pus and extracted seven stones." This was, I think, one of the earliest operations for gallstones in this country. His mother recovered.

In going through Dr. Halsted's bibliography I find twenty-one papers which

he presented before medical societies or published in medical journals during his New York years, 1882 to 1886. They are on a variety of subjects and, while often presenting an interesting viewpoint or deduction at variance with the accepted opinions of the time, the majority are the sort of papers one might expect a busy young practitioner to present before a surgical society today—interesting case reports, the results of particular operations, and so on. But there were included among them his paper on the effect of abduction and adduction on the length of the legs in fractures of the neck of the femur, which permitted better understanding of the effect upon leg length of pathological conditions about the hip; and his papers on cocaine anesthesia which were epoch-making and which, in the light of their effect upon the development of local anesthesia as contrasted with general anesthesia, must be considered among his greatest contributions to surgery.

Here, too, began his interest in investigative work of which one may cite his clinical studies on the use of the hot bath in the treatment of infections, his sliding apparatus as an addition to Buck's extension in the treatment of fractures of the neck of the femur, his method of treating fractures of the lower extremity, and his design of a new chart for recording the temperature, pulse and respiration of patients. Of these his introduction of the hot bath in the treatment of infections was, perhaps, the most important. Dr. Halsted was, throughout his life, convinced of the value of the method, and we at the Johns Hopkins Hospital continued to use it successfully in the various serious infections of the extremities. His contributions to the treatment of fractures were also important. Fracture apparatus has changed in many respects, but the principles of traction and countertraction which he developed in reducing and controlling fractures of the extremities remain the essential features of the method.

An examination of the records of Bellevue Hospital reveals that during the year 1884, 122 patients were admitted to Dr. Halsted's service at Bellevue Hospital. Of these 53 were admitted for fractures, 24 for wounds, burns, frostbite and simple contusions, 9 for infections of soft parts, bones 2 patients and joints 2 patients, 15 for genitourinary conditions of which stricture of the urethra or rupture of the urethra were most common, 5 for simple rectal conditions, 6 for tuberculosis of glands and joints, 6 for non-tuberculous chronic diseases of the joints, and 4 for miscellaneous conditions. Of the 122 patients 31 were subjected to operation. In the group of 53 patients with fractures, 4 were operated upon, 3 for compound or depressed fracture of the skull and one for compound fracture of an extremity. In the group of 24 with wounds, burns, frostbite and simple contusions 2 were operated upon, one requiring an amputation for a crushed leg. Of the 9 with infections, 8 were operated upon, 1 for appendiceal abscess. Seven of the group of 15 with urological conditions were operated upon and 3 of the group of 5 with rectal conditions. Of the 6 with

tuberculosis of the glands or joints, 4 were subjected to operation as were 3 of the 4 miscellaneous conditions. The 6 patients with chronic tuberculosis of the joints were not subjected to operation. During the period there was not one deliberately planned operation within the abdomen except the direct incision of an appendiceal abscess in one instance; and there was no operation involving the thoracic cavity. In three cases a compound or depressed fracture of the skull was operated upon but the brain was not deliberately exposed.

While very brief, this summary of his professional activities in New York will serve to show Dr. Halsted's enthusiasm in his work, his amazing energy, strength and endurance. Regular hours of teaching in the dissecting rooms of the college, a quiz of sixty-five or more students at his house, daily attendance in the morning at the Roosevelt Hospital Dispensary, services at Bellevue Hospital, Presbyterian Hospital, Charity Hospital, Emigrant Hospital, and Chambers Street Hospital, in all of which he was active on the wards and in the operating rooms day or night, this forms a schedule of work which only a man of boundless enthusiasm and amazing strength could have encompassed in twenty-four hours. It is remarkable that he should have found any time to think or to prosecute original work.

Despite these many duties he seems to have found time also for some of the amenities of life. He lived with Thomas McBride in a house on Twenty-fifth Street between Madison and Fourth Avenues. They took great pride in their house, which was luxuriously furnished, and welcomed their friends, who were accustomed to drop in upon them at any time. Among these was Dr. Welch, who recalled the vivacious conversation among the men he commonly found there. These included stockbrokers, architects and men in other professional callings. Mr. Allen W. Evarts has this to say of Dr. Halsted: "At the time we first met he and a Dr. McBride... kept house together in handsome fashion in Twenty-fifth Street just around the corner from the University Club then at the corner of Twenty-sixth Street and Madison Square. The club then recently formed was frequented by men from twenty-five to fifty years of age, to a large extent acquainted with one another. Halsted, though as a rule dining at home, was much at the club in his leisure time and I recall him as often in the bowling alley, tenpins being at one time very popular. I don't think that he ever played cards. His house was a very hospitable one and frequently one or two or three would be asked to come around to dine at their well appointed and well supplied table which seemed always to have provision to welcome a chance comer. For the four years we were thrown together in this circle of friends and familiar acquaintances I gained an intimacy with Halsted perhaps as great as could be expected between busy men of our age. My recollection of him is that he was a delightful companion of gay and cheerful disposition, kind heart and agreeable and cultivated manners and that he was seriously devoted to his profession.

"One of the amusements of those days was the formation of an association to have a male quartet give a concert at Halsted's house during the winter season on Sunday afternoons, which kept up for two or three years. Halsted invited me one night to go with him to the hospital (Bellevue I think) and I saw him perform two operations, one an abdominal one, and though I was not perhaps qualified to judge, I greatly admired the skill he displayed. I recall his giving me an injection of cocaine when that drug was first attracting attention and was being experimented with."

IV. TRANSITION PERIOD. COCAINE

A fascinating aspect of Dr. Halsted's life is the alteration that occurred following the transfer of his activities from New York to Baltimore. Those who knew him well and were familiar with his life in New York and in Baltimore find two entirely different individuals. From all accounts of him in New York he was a bold, daring and original surgeon; a prodigious worker, as already outlined, who with it all was a gay, cheerful soul, intimate with his students, holding open house for his friends, giving concerts at his home, enjoying people, and apparently one of them in their sports and pleasures. The Halsted of Baltimore was the antithesis of this: thoughtful, careful, meticulous and preeminently a safe surgeon; a teacher as far removed from the quiz master as one could conceive possible; a worker indeed, but one who avoided hospital appointments, who limited his operative work, who sought leisure for study and reflection and became a profound thinker and surgical philosopher; and a man in relation with others, shy, retiring and remote, avoiding the crowd and its plaudits and preferring a seclusion which only a few choice friends were permitted to invade. To what extent this remarkable change was due to his ill health in the years 1885 to 1886, and more particularly to his addiction to cocaine, has been the subject of many hours of speculation and discussion. For he and some of his associates, as is well known, became addicted to the drug during their experiments, but in a wholly innocent way. It was in September, 1884, that Koller announced at the Heidelberg Ophthalmic Congress that the newly discovered drug, cocaine, would render insensitive the conjunctiva and cornea of the eye. Dr. Halsted was prompt to seize upon this discovery, and with his associates Richard Hall and Frank Hartley began at once a series of experiments to test the value of the drug as a local anesthetic for surgical operations. A handwritten letter to Sir William Osler, under date of August 23, 1918, in answer to his inquiries regarding anesthesia will interest surgeons. I quote it almost completely.

HIGH HAMPTON, CASHIERS, N. C. August 23, 1918.

"Dear Osler,

"Thank you for your kind permission to reproduce your cut of the famous case of arteriovenous fistula. I wish I had known more about the subject when your patient was in Baltimore. You will, I believe, be interested in my little paper on the subject which should soon appear in Surg., Gyn. & Obstetrics.

"Yes, I published 3 or 4 little papers in 1884–1885 in the New York Med. Jour. on the subject of cocaine anesthesia. They are not creditable papers for I was not in good form at the time. But I anticipated all of Schleich's work by about 6 years (or five). We discovered that very mild solutions and even water would produce anesthesia if properly injected—injected so as to produce distension and anemia of the tissues. We also injected all the accessible nerves in the body—sciatic, internal pudic, brachial plexus, inferior dental, etc. I did not know until 1914 that Richard Hall of N. Y. (son of Rev. John D. Hall), my first assistant at Roosevelt Hosp. had described an operation which we performed together in my house in N. Y. A rich and influential woman permitted me in 1885 to excise her inferior dental nerve (Paravicini's method) for trigeminal neuralgia, under cocaine. I injected the nerve opposite or rather above its entrance into the canal before incising the mucous membrane. On exposing the nerve I clamped it with a specially designed broad (1.5 cm) forceps to insure the excision of a long piece. The final snip of the scissors through the nerve divided a large artery, probably the internal maxillary. The patient's mouth filled with blood as if poured in by cup-fulls. Tom McBride, whose patient she was, rushed out of the room not wishing, as he told me afterwards, to be present at the death. Gauze plugging finally arrested the hemorrhage. The patient was put in my bed and two trained nurses summoned. For two nights I slept in the same room and then transferred her to my service at the Presbyterian Hospital. She made a good recovery. It is odd that I happened in 1914 to be attending a meeting in Berlin of the Deutsche Gesell. f. Chirurgie when this case was referred to by Rehn. I asked him how he knew of it. He said that Richard Hall had published it. I have since then seen this case mentioned in German articles. À propos of this, it interests me to recall a visit I made to Vienna in the autumn of 1885, when I showed Woelfler (Billroth's first assistant) how to use cocaine. He had declared that it was useless in surgery. But before I left Vienna he published an enthusiastic article in one of the daily papers on the subject. It did not, however, occur to him to mention my name. Having occasion to have a tooth attended to by Thomas, the famous American dentist in Vienna, I showed him how to inject the inferior dental nerve from within the mouth. He became so enthusiastic on the subject that he requested me to inject the inferior nerves of two assistants whose teeth he filled while they were insensitive.

"Corning's book on cocaine anesthesia was based almost entirely on my work. He was a student of mine and followed my work with cocaine closely. One of my papers* was entitled "A report of about 2000 operations with cocaine" (approximate title). The list included some major operations such as amputations, exsections of joints, excision of axillary contents. You will perhaps recall that when the J. H. H. opened we were employing local anesthesia much as we do today. This was some years before Schleich.

"I might mention that we discovered the effect of anemia in prolonging almost indefinitely the anesthetic action of cocaine. Consequently we usually employed the Esmarch bandage when operating on extremities. You will, I fear, regret having asked the question which has brought forth this rambling reply. Woolsey, Hotchkiss, Walter James and Christian Herter were students of mine at the time we were making these experiments and took part in them.

"Will you give our love to Lady Osler

ever yours W. S. HALSTED."

The experiments mentioned by Dr. Halsted demonstrated that tissues into which cocaine had been injected became insensitive so that operations could be performed without pain; that various nerve trunks when injected caused anesthesia of all the tissues supplied by them and their various branches; that the anesthetic action of the drug was prolonged if the circulation of the part was impeded by a tourniquet; and that very weak solutions of cocaine and even of water or salt solution will cause anesthesia if injected to the point of distension of the tissues. The group noted that if stronger solutions of cocaine were given by injection they became for a time nauseated and dizzy and staggered when they walked. They discovered that if the powdered drug was snuffed up the nose by those who had a cold they breathed more easily; and they found that when used in this manner it gave also a feeling of exhilaration and a sense of keen enjoyment, as at the theater. It was not long before the evil effects of the drug became known; but by that time Dr. Halsted and some of his associates had become addicted to its use. Three who acquired the cocaine habit died without recovering from it. But there is, to me, good evidence to show that Dr. Halsted conquered it through superhuman strength and determination and came back to a life of great achievement.

It were well could the matter be closed with these statements. But there are those who believed that he never recovered from his addiction, that the remarkable change in his character and in his mode of life and even the development of his particular kind of surgery may be traced to a continuing use of the drug. As an example of this viewpoint I may quote the remarks of a well-known

* Note on bottom of letter: "Practical comments on the use and abuse of cocaine; suggested by its invariably successful employment in more than one thousand minor surgical operations." N. Y. Med. Jour. 42: 294, 1885 (to be concluded, but wasn't.) W. S. H.

surgeon during a discussion of MacCallum's biography. He pointed out "the very abrupt change in Halsted's nature when he moved from New York to Baltimore; that he had been a vigorous, rather showy, didactic, bustling individual; that he became a very refined and most punctilious and fastidious individual. In the interim, between New York and Baltimore, he acquired the cocaine habit. The real truth of the matter is, he never conquered it. There are several proofs of this and perhaps MacCallum should have faced it, for he must have known it and should have published it in his book, for it would have been a wonderful story of a person who, like DeQuincey, carried a pernicious habit to old age and death unbeknownst to the rest of the world."

"There are many instances in support of this. Shortly after accepting the Hopkins position he took a long trip to South America and took with him not quite enough cocaine to make the trip, hoping he could cut his daily dose down. But he could not do this and found himself about the equator sailing home without coaine. He rifled the captain's store and stole what was there—a fact which never got out.

"Moreover his change in philosophy is entirely in keeping with the cocaine habit. The story of his going home at 4.30 every day and locking himself in his room for an hour and a half before dinner, the stories of his many trips to Europe each summer when he never saw anyone but locked himself up in a hotel and took his drug, leave to those who know this the feeling that MacCallum failed to write one of the greatest romances of modern life.

"There is another very interesting side to this Jekyll and Hyde character. That is that it might even seem that the whole Halsted school of surgery which has been called a School for Safety may have been due to this drug addiction. Note that Halsted before the addiction with cocaine was a brilliant, rapid, spectacular operator, that just as he changed his character and his dress to that of a fastidious person, paying great attention to details—a matter which characterizes cocaine addiction—so his outlook on surgery itself was changed and he in turn devoted himself to the infinite precision of little details of surgery. There was no longer the picture of the brilliant rapid operator but the cautious individual with tremendous and profound devotion to the little things. His fastidiousness in disposition was carried to fastidiousness in technical surgery and this change in character which has given rise to the greatest school in surgery this country has ever seen, may have been due to cocaine addiction. What a romance, and what a wonderful example of how destinies of men are influenced by extremely little things."

The above is an interesting and romantic viewpoint in explanation of Halsted's life and work as a surgeon in Baltimore. In testing its soundness the question at once arises whether a man could have, over a period of time, constantly taken the drug without suffering the marked deleterious effects upon mind and body the drug is known to produce. Such effects were not present,

for until his death in 1922 Dr. Halsted's mind was as keen and alert and his interest in surgical problems as intense as ever.

Considering the matter from the broader viewpoint of Dr. Halsted's career as a surgeon it may be asked why the question of the cocaine addiction is of such singular importance. Whether or not he continued to be addicted to the drug, it remains true that his great contributions to surgery were made during his period in Baltimore—*after* his experiments with cocaine. Considering the matter from the narrower standpoint of determining the truth regarding the addiction I doubt that any more evidence or facts will be unearthed to clarify the situation.

It is true that under the persuasion of Drs. Munroe and Vander Poel he went to a hospital in Providence for the cure of his addiction; that he took a sea voyage to the Windward Isles in February and March, 1886; that he was invited to come to Baltimore in December, 1886, by Dr. Welch who was then established as the Professor of Pathology of the Johns Hopkins Medical School and Hospital, and that he again, after coming to Baltimore, returned for a period to the hospital in Providence, presumably persuaded to do so by Welch.

It is also true that almost at once after his arrival in Baltimore he undertook his experimental work on intestinal suture, an original work requiring intelligence, ingenuity and application. From then on until 1922, a period of thirty-six years, he was the active head and the inspiration of the greatest University Surgical Clinic in this country. Welch, throughout his life his most intimate friend, with whom he lived and worked in Baltimore in the early years, unequivocally states that Dr. Halsted recovered from his addiction and that "instead of reflecting injuriously upon Halsted's character they [the facts] bring out a strength of will and tenacity of purpose and a triumphant issue of a hard struggle rarely exemplified in similar circumstances." MacCallum in his biography is equally confident that he conquered it,—and MacCallum would not have come to this conclusion without careful study. On the off chance that he might have new evidence acquired after the publication of his biography, I wrote him in December, 1940, regarding this matter. He again investigated it, consulted all those who might have knowledge of it, and wrote me that he had failed to find any evidence that Dr. Halsted continued the use of cocaine. He stood firmly by his statements made in his biography.

An eminent scientist has affirmed that he "knew all along that he was taking cocaine." I wrote to him in 1940 asking him whether it was true from his own knowledge that Dr. Halsted continued to use cocaine, and whether from his experience with drugs a change in character such as Dr. Halsted exhibited could be attributed to cocaine, and whether in his opinion such a distinguished

career could have been achieved by one who took cocaine consistently for at least thirty-six years and at the end of that time retained such activity and keenness of intellect. No reply to my letter was received and he has since died. Though he spent some years at Johns Hopkins as a student and later in the department of pharmacology, there were only two years when he could have known Dr. Halsted, and in the years of my association with Dr. Halsted I do not recall that Dr. Halsted ever mentioned him. It was doubtful that he was in a position to know intimate details of Dr. Halsted's life.

Dr. Halsted's health almost certainly affected his mode of life and activities in Baltimore. Aside from the usual colds and other conditions which afflict everyone, he was subject to attacks which around the hospital were thought to be anginal in character and which were sufficiently severe to interfere with his work. Sometimes in the operating room with the scalpel in his hand ready to begin an operation or during the course of it, he paused, stood perfectly still, his face gray with anxiety and suffering. Without referring to his condition, he handed the scalpel to his assistant with an apology and with the request that he continue the operation. Sometimes he sat on the operating stool for five or ten minutes, or he left the operating room and went to his office. He changed into street clothes, either returning at intervals to the operating room to see how the operation was progressing or, more often, leaving the hospital before his assistant had finished it. In his later years he was found to have gallstones in the common duct, a condition which gives rise to attacks simulating angina; and it is certain that he suffered from gallstone disease for many years before it was recognized. This condition sufficiently explains his need for rest and quiet and his avoidance of too great activity in the operating rooms and wards of the hospital as it does his need of rest during his visits at clinics abroad.

As far as I can recall Dr. Halsted referred to this condition but once and then to say that the men in his family died at or around seventy and that he also expected to do so. He was operated upon twice for gallstone disease and after the second operation died from complications that followed it. During his illness in the hospital, in which on two different occasions he remained for periods of over a month constantly attended day and night by special nurses, he failed to show any deprivation symptoms. Mont Reid, who was closely associated with him for years and who came from Cincinnati to devote practically his entire time to his care during his last illness, was certain that he was not addicted to the drug. Close members of his family, especially Mrs. Halsted's nieces, and his several secretaries who worked with him for years in his home, declare that never in their association with him was there the slightest evidence of drug addiction.

V. EARLY YEARS IN BALTIMORE

In December, 1886, Dr. Halsted was invited to come to Baltimore by Dr. Welch, with whom for a time he lived in the house at 506 Cathedral Street. When he arrived, the Johns Hopkins Hospital was under construction. There was a period, then, between the time of his coming and the formal opening of the hospital, May 15, 1889, when he had little opportunity for clinical work and devoted himself largely to experiments in Dr. Welch's pathology laboratory. He had the title of Chief of the Out-Patient Department and Acting Surgeon to the hospital, but it was not until later that he was made Surgeon-in-Chief of the hospital and still later, April 4, 1892, Professor of Surgery in the Johns Hopkins Medical School.

The idea of the development of a medical school in connection with the hospital had been in the minds of the University authorities as early as 1880; and in this development Dr. John S. Billings, the Librarian of the Surgeon General's Library, played an important part. The professors of the clinical branches in the medical school were to occupy also the headships of the major clinical departments of the hospital, and the first appointments were made with this in mind. Dr. Welch had been appointed Professor of Pathology in 1884 and became Pathologist-in-Chief to the Hospital. The chair of surgery was first offered to Macewen, a prominent surgeon in Scotland; but his impossible demands having made him unacceptable, Dr. Welch won Dr. Billings over to the choice of Halsted. Dr. Welch also was responsible for the selection of Osler, who was appointed Professor of Medicine and Physician-in-Chief to the hospital in 1889. Dr. Howard Kelly was Dr. Osler's choice for the chair of Obstetrics and Gynecology for neither Welch nor Billings knew him. Thus it came about that Drs. Welch, Halsted, Osler and Kelly, subsequently known as the "Big Four," became identified with an institution which through them and their associates was to have a most profound effect upon medicine and medical education in this country.

At the time of the opening of the hospital Dr. Halsted was the only surgeon appointed to the staff of the hospital and faculty of the medical school; and it devolved upon him to organize the surgical service of the hospital, to select the members of his staff, to develop plans for the teaching of surgery to undergraduate and graduate medical students, to secure proper laboratories essential for his work, and to continue, with wider opportunities, his clinical and experimental investigations. From conversations with him it would appear that, at the time the hospital opened, he had already developed his ideas and formulated in part at least the plans for the surgical department.

The organization of the surgical service differed greatly from that which obtained in hospitals of that time. The purpose was to utilize the general surgical service not only for the care of the sick but for the education and

training of young surgeons with Halsted as directing head and almost sole participant in this activity. Instead of many surgeons having a "service" in the hospital, there was but one service continuous throughout the year, with Halsted in charge and under him a group of eager, intelligent and enthusiastic young men, pursuing an education in surgery and quite ready to devote seven to ten years to this purpose. Dr. Halsted's rigid adherence to this program gave rise to some criticism in the hospital and elsewhere; for it was natural to assume that men qualified as surgeons, who devoted years of unselfish work to the institution, would be rewarded by being granted privileges in the surgical wards. It is the writer's opinion that it was not because of lack of appreciation of either their fitness as surgeons or of their long services that they were not granted such privileges, but that the training of surgeons was really Dr. Halsted's greatest ambition and satisfaction in life and he was unwilling to endanger it by complications arising from multiple services. In the development of his department he was convinced that a man should pursue a specialty only after a long and thorough preparation in general surgery; and with the rise in specialism he was on the lookout for men so trained to appoint to the specialties which he thought proper to develop.

The teaching of surgery to medical students was also a departure from the common practice in medical schools of this country. Instead of only reading assigned textbooks, attending lectures and "dry" clinics at which the professor demonstrated surgical diseases, or viewing operations which were performed with dexterity and rapidity and often with an eye on the clock, the undergraduate student through a "clinical clerkship," was assigned to the surgical wards and came into direct contact with patients. It was his responsibility to take complete histories and to make careful and thorough physical examinations and such other tests as blood counts and urine analyses. All this became a part of the permanent hospital record and the need for careful work was stressed and the work itself checked by interns and residents. It was expected that the student would "read up" on his cases so as to become familiar with the surgical diseases they represented; and it came about that an interested student could, through discussions with his fellow-students, become familiar with all the patients in the wards. On ward rounds by the professor or his resident it was the student who presented the history and physical examination and he usually knew all the details of the cases. This very practical clinical work was supplemented by ward rounds, by an operative clinic held by Dr. Finney on Friday morning and by a "dry" clinic held by Dr. Halsted Friday at noon, by work in the surgical outpatient dispensary, and by a course in operative surgery on animals given in the Hunterian Laboratory.

Dr. Finney's operative clinic was a demonstration of sound surgical practice and represented the highest type of the art as practiced by the great surgeons of the day. With a background of enormous experience, he operated skilfully

and unhurriedly, rarely got himself into difficulties and usually extricated himself quickly when he did. There was never an attempt at showmanship; rather he explained in the course of the operation the purpose of each important step, the complications which might arise and the results to be expected. His surgery differed from that of Dr. Halsted in that he did not use the same care in every detail of the operation. During a phase of the operation he could be and was as careful as anyone; but in the handling of tissues, the meticulous closure of the wound, and generally in the refinements of a surgical procedure he lacked the finesse of Dr. Halsted. The two men were essentially different in their attitude toward certain details in operative surgery; yet each recognized the qualities of the other and respected them.

Dr. Halsted's Friday clinics were quite unlike any with which the writer was, at the time, familiar. They did not consist of the usual presentation of the historical aspects, pathology, clinical manifestations, diagnoses and surgical treatment of a group of cases. He assumed that the students could and would, if interested, read in textbooks what was commonly known about conditions exhibited by the patients. Rather the cases were presented as surgical problems, the solution of which still awaited further study. For example, he questioned the students on conditions which determined the elimination of wound infections; on the important factors in the cure of hernia; why the subclavian artery may dilate distal to, rather than proximal to, a cervical rib; why a bone harboring a malignant tumor may elongate; why the thyroid gland in exophthalmic goiter shows its particular histological picture. Usually the problems discussed were those in which he was interested at the time and was actively investigating in his experimental laboratory. He took the students into his confidence and tried to carry them along with him in their solution. It was an impressive demonstration of wide reaching, profound knowledge and fertility of suggestion,—a keen scientific mind at work.

With the students themselves he was distant, reserved and courteous. There was never a suggestion of familiarity, and the contrast between his deportment and the free and easy relationship between professor and students which I observed elsewhere was striking. He had somewhat the continental attitude towards them. He kept no record of attendance at clinic or ward rounds and appeared not to be concerned whether the students did or did not attend his teaching exercises. He brought four to six students down from the benches to discuss the cases with them, to the delight of all the other students who escaped what was something of an ordeal. For the students found great difficulty in following his discussions and indeed often did not know what they were all about. But he showed great satisfaction and interest in a student who, having apparently followed one of his profound discourses, gave him an intelligent answer. Such a student he was sure to enquire about and would determine his name, his college and the possibility of his interest

in surgery and a surgical internship, for he was always looking for the exceptional man for his resident staff. He rarely showed irritation at students' inability to follow him in his discussions and was not sarcastic as he not infrequently was when members of his resident staff were stupid. He occasionally took a good-natured "dig" at them. To a student who, on being asked the diagnosis of a diseased condition of the hip joint said, "You would think of tuberculosis," he replied, "Yes, you would think of it, but you wouldn't think of it long." That was about the extent of his venomous remarks. When he met a single student, as for example in an oral examination, he was embarrassingly courteous, opening the door for him, moving a chair for his convenience, and listening to what he had to say with such absorbed attention as to suggest that some very important observation was being made.

The reactions of the students to Dr. Halsted's attitude toward them may well be imagined. To us, while I was a medical student, he was a very superior being. Secretly, like all others about the hospital, we called him "The Professor." We realized that here was an unusual man, one from whom we should in some way greatly profit, yet his methods of teaching and his profound discussions defeated us and made us feel that we were not profiting as we should. Subsequently when I myself taught classes of students I had the opportunity of discovering their reaction to Dr. Halsted; and it was always much the same as I have described for my own class. Only in later years did they realize that they had got something from the Professor which they did not appreciate as students. I have travelled about the country a good deal, and not infrequently I have met a group of Hopkins graduates at dinners and other gatherings; and it is striking how often I hear men say that of all their teachers, Halsted had the greatest influence upon their careers whether in medicine or in surgery.

While the students often expressed the wish that Dr. Halsted would occasionally come down to their level intellectually and discuss matters which they could understand, it is certain that they carried away with them from the clinics something of great value in their future careers—the desire to emulate Dr. Halsted in his attitude toward scientific surgery and the hope of making some contribution to the sum total of medical knowledge through clinical and experimental research.

The course in operative surgery on dogs was again a departure from the usual procedure. Indeed, when inaugurated it was probably the only course of its kind in this country. Since the broad subject of surgery includes not only symptomatology, pathology, diagnosis, pre- and postoperative treatment, but also operative therapy, it presents certain difficulties in the teaching of the undergraduate student. He has learned in previous courses something of the bacteriology of surgical infections and can observe the operative therapy of surgical conditions as carried out by his teachers and as described in text-

books; but the whole field of surgical asepsis, the handling of tissues, the control of hemorrhage and the details of surgical operations cannot satisfactorily be taught because he is not properly prepared and therefore cannot be permitted to gain knowledge of these subjects upon the human being. To fill this gap in teaching Dr. Halsted organized a course in operative surgery upon dogs; at first in rooms allotted to him by Welch and Mall and later in the Hunterian Laboratory. The students were divided into surgical teams each consisting of the operating surgeon, two assistants and the anesthetist. They were provided with an operating table and the necessary instruments and linens and a series of operations was performed, the students rotating through the various positions on the surgical team. Each member of the team had assigned duties, and at the completion of the course had learned from practical experience the important facts concerning the administration of anesthesia, the sterilization of instruments and supplies, the principles of aseptic technique, the handling of tissues, the control of hemorrhage and the detailed steps in a few surgical operations. Instructors among the resident staff assisted in directing, criticizing and checking each student's work. It was understood that the patient (dog) should receive all the attention and care of a patient in the hospital, and it was the student-surgeon's responsibility to visit him frequently and attend to his postoperative treatment. Those who object to the use of animals for teaching and research purposes would have been impressed at the excellent care they received. It could not be otherwise, considering Dr. Halsted's love for dogs.

It is evident that Dr. Halsted considered this course of great importance. In a letter to Welch he writes: "I should be sorry to have it forgotten that I initiated the operative course on animals. Some were held in your autopsy rooms but most of them in a room allotted to me by Mall." Again he writes: "Courses in experimental surgery were given to the first class in their third year (1895). One of the inducements offered to Cushing to return to us [he had gone to Europe to work under Kocher] was the transference of these courses to him. Very soon after he joined our staff I asked him to assist me in my experimental work and urged him to take up the study of the hypophysis." Cushing apparently took over the course in 1901, and after the Hunterian Laboratory was built in 1905 carried it on there until his departure for Boston.

The undergraduate teaching of surgery as developed by Dr. Halsted was undoubtedly a most important contribution and has since been adopted by many of the outstanding surgical clinics of the country. But his greatest contribution to the teaching of surgery was in the field of advanced or graduate education, a field which held his interest throughout his long career. Undoubtedly strongly influenced by his experience in New York and by the training of surgeons as observed by him in the German university clinics, he was determined to organize a course in graduate education which would enable

young men in this country to follow the higher careers in surgery. The need for such education impressed him greatly. In an address on the "Training of the Surgeon" given at Yale in 1904—fifteen years after the formal opening of the Johns Hopkins Hospital—he stated: "Although we now have in the United States several (five or six) moderately well endowed medical schools with a university connection, the problem of the education of our surgeons is still unsolved. Our present methods do not by any means suffice for their training. Do we require stronger proof of the inadequacy of these methods in producing young surgeons than is presented by the so-called sacrifices which our young men today are willing, nay, most eager to make in order to obtain a training which seems even to them not only desirable but absolutely essential for success of a high order?" Later in the address he states: "We need a system and we shall surely have it—which will produce not only surgeons, but surgeons of the highest type, men who will stimulate the first youths of our country to study surgery and to devote their energies and their lives to raising the standards of surgical science." As soon as clinical material in the wards of the hospital permitted, he introduced the so-called resident system. It provided opportunities for a carefully selected group of men to spend six, seven or more years in residence in the hospital, free from the distractions of ordinary life. It provided laboratory training in surgical pathology and experience in experimental surgery; long years of intimate contact with patients for the acquisition of knowledge of surgical diagnosis and of pre- and postoperative treatment; and experience in operative surgery and its technical methods acquired both by assisting their chief and by themselves performing a large number of operations. It was, really, the inauguration of a school of surgery which became known as the "Halsted School of Surgery;" for it embodied all the refinements in surgical asepsis, control of hemorrhage, handling of tissues, and wound healing which made Halsted's surgery distinctive at the time. Advancement in this program depended upon a man's ability and no man was promised more than one year's work. If advancement took place his training culminated in the position of resident surgeon, a post of great responsibility involving the care of all the patients in the surgical wards. This position he might hold for one to three or four years. Bloodgood held it for five years.

This program of graduate education is now well known and it is unnecessary to go into further detail regarding it. It has had a profound effect upon the development of surgery in this country. It has been adopted by an increasing number of our first class medical schools; it has insured the training of a steadily increasing number of heads of departments of surgery and first rate surgeons; it has been responsible for the invasion, with great safety, of all the cavities of the body so that operations upon the brain and spinal cord, the organs of the chest and of the abdomen are now commonplace. It has brought the highest type of surgery to a now inestimable number of patients; and it

has been a constant stimulus to surgical research. Dr. Halsted realized that he, as an individual could do little in comparison with the many he might train to carry on his methods either as heads of departments in other clinics or in surgical practice.

VI. RELATIONS WITH COLLEAGUES AND STAFF

Ten or twelve years had elapsed after the opening of the hospital before the surgical staff and the headships of the various subdepartments of surgery were properly established. During these years Dr. Halsted and his resident staff were in charge of the surgical wards; Finney became chief of the surgical dispensary; Cushing, Young, Baer and later Crowe headed respectively the subdepartments of neurosurgery, urology, orthopedic surgery and otolaryngology; Bloodgood was placed in charge of surgical pathology and Baetjer of roentgenology. In 1905 the Hunterian Laboratory offered the surgical department its own experimental laboratory, and with this development the department became pretty well established and remained the same until Dr. Halsted's death. The one exception was the loss in neurosurgery of Cushing, who was succeeded by Heuer and later by Dandy. There were, however, further developments. Finney in the surgical dispensary assembled a group including William Fisher, Richard Follis, Harvey Stone, Omar Pancoast, Bertram Bernheim and Harry Homer. Cushing, Baer, Young and Crowe were granted special assistants whom they trained in their respective specialties and were permitted a limited number of beds in the surgical wards.

At about this time also the intimate relationships of Halsted with such men as Mall and Flexner, who had all worked together in Welch's laboratory, ceased. These men had gradually become more immersed in the conduct of their own departments and in their own affairs. Dr. Halsted's relationship with them was cordial but, as far as I could determine, not intimate. He was of course devoted to Welch, undoubtedly his closest friend; and he never ceased to speak of Welch's virtues and used him as an example for young men to follow. Indeed he more than once spoke of the inadvisability of marriage, pointing to Welch, a bachelor, as an example of what might be achieved if a man devoted himself solely to scientific medicine. He often spoke of Mall, in whose laboratory I had worked as a medical student but who had meanwhile died. He held Howell and Abel in highest esteem, as also Osler, who in 1905 went to Oxford, England, as Regius Professor. These were the men of whom he spoke most frequently. He had a great fondness for Thayer and Tom Boggs; and referred often to MacCallum, Barker and Howland. Of his own senior staff he was fondest of Finney; a man of lovable character who performed greatly, asked little, and was always ready to help the resident surgeons in their difficulties.

Next to Finney he was, perhaps, fondest of Follis; a man who, after his residency in surgery, had settled in Baltimore to practice. But he was intimate with few and his habits of work precluded frequent contacts with his colleagues. He spent a great deal of time at home where, with his excellent surgical library and his two, sometimes three, secretaries, he did all his reading and writing. When he came to the hospital he often lunched alone in his office on milk, bread and butter and a cold meat; occasionally he went to the hospital staff dining room where a table was reserved for heads of departments and senior members of their staffs. His own shyness made it difficult for him to participate easily in the friendly laughing intercourse of a large group; his remoteness made it difficult for others to take him in as one of them, which they would have been delighted to do. He avoided people, very often deliberately. Walking through the corridors of the hospital, he would see someone approaching in the distance and quickly turn up the stairs to a ward to escape him. At times he did not offer an explanation; occasionally he explained the reason for his action; and usually it was some one he did not care for, or one who talked too much and would delay him, or one who wanted something. Altogether, in relation with his colleagues he seemed a lonely figure, but whether he felt lonely I cannot positively say. He was aware, of course, that the position he occupied as head of the surgical department placed him beyond the happy social intercourse enjoyed by others around the hospital, and he reminded me more than once that if I aspired to be the head of a department I must make up my mind to forego many pleasures in life.

In relation with his intimate friends I had few opportunities to observe him. Rarely on going to the dining room of the Maryland Club in Baltimore I was invited to dine with him, Welch and perhaps one or two others. One might find on such occasions a wholly different Halsted from the Halsted in a crowd or with strangers, or at the hospital. His shyness gone, keen, witty, a master of quick repartee, he was the "life of the party" and seemed thoroughly to enjoy himself. Welch, no mean verbal fencer, was no match for him, nor was anyone who happened to be there when I was present. MacCallum, in his biography, commented upon his witty remarks and shrewd humor, particularly in his few after-dinner speeches, but found it difficult to say just what in his remarks was so delightful and laugh-provoking. I am equally at a loss. I have set down on paper remarks which Dr. Halsted made which provoked a gale of laughter. Some seem amusing, though less subtle, such as interrupting a speaker in the middle of a sentence with intent to confuse and discomfit him; but those which gave the keenest delight and caused the greatest merriment sound flat when put on paper. The explanation must be in a combination of circumstances: the Professor exhibiting a little known facet of his character; the occasion, his look as he spoke, the unexpected turn of his remarks and the way he made them.

Left to right standing:
Roy D. McClure Hugh H. Young Harvey Cushing James F. Mitchell Richard H. Follis Robert S. Miller John W. Churchman George J. Heuer
Early Associates and Residents
of Dr. Halsted in Baltimore
Left to right seated: John M.T. Finney William S. Halsted Joseph C. Bloodgood
25th Anniversary
Johns Hopkins Hospital
Wed., Oct. 7 1914

Dr. Halsted's most frequent contacts at the hospital were with the resident staff, particularly with his resident surgeon; and I believe he derived his greatest pleasure and satisfaction in association with him. This was particularly true if his resident staff was made up of able, hard-working, honest and understanding young men. With such he liked to associate. He took the keenest delight in watching one of his young men perform well a difficult operation; and while never mentioning his own performance, he was most likely to speak of his resident's. He was equally pleased when one of them carried out a piece of investigative work in the laboratory, and in telling about it never mentioned what was likely to be true, that he had furnished the idea and probably the method of solving the problem. On his visits to the wards, in the operating room, and in the experimental laboratory he consciously or unconsciously stimulated these men, more by his example than by anything he said. He was a hard taskmaster in the sense that he demanded the highest type of work; and he could be cruelly sarcastic if he did not get it. The trick was to be so good as never to deserve his displeasure; for he was not mean in any way and never vented it unless deserved. Three types of men he would not have around him and they had a way of disappearing from the staff: the man who was not able and failed to give promise of developing into the sort of surgeon Dr. Halsted desired to produce; the man who attempted to attract his attention by persistently courting him; and the man who was dishonest. The dishonesty of which I speak was most often the attempt to evade an answer regarding the condition of a patient or to make an answer believed to be true but which had not been verified by a recent visit to the patient. If the answer proved to be wrong, it was unfortunate for the man who made it. One of the earliest things I learned as a junior assistant on the staff was that it was far better to be fearlessly honest and admit one's lack of accurate knowledge regardless of the consequences, than to be caught, as one seemed destined to be, in a misstatement of the facts.

Precisely how Dr. Halsted evaluated the members of his resident staff was not always clear to me. Some he chose for advancement early and with confidence in their future success; others he soon decided were not for promotion and to them he paid little attention. Indeed he once asked me who a man was who had just spoken to him when it was a man who had been on his resident staff for two or three years. It should not be supposed that the men he let go had no future in surgery, but rather that they did not measure up to his standards. That a surprising proportion did succeed I learned when some ten years ago I traced the men who had been members of Dr. Halsted's resident staff. His first notice of me, as far as I can tell, occurred when I was a junior assistant on the wards when one day he suddenly, and to me surprisingly, asked where I came from. On my answering Madison, Wisconsin, he said, "Why that's near where my lens grinder lives," and he told me that in a small village near

Madison which I knew well there lived a most expert lens maker who had ground lenses for his telescope in the mountains of North Carolina. I was never sure, thereafter, that his interest in me and my subsequent advancement did not derive from my association in his mind with the lens grinder!

It is clear that Dr. Halsted studied his men but in a way not noticeable to those about him; for he not only selected those for promotion with accuracy but he attempted and, in most instances, succeeded in appraising them with reference to their special capabilities, whether these lay in the operating room, the experimental laboratory, or in a specialty in surgery. Indeed his greatest interest and pleasure seemed to lie in his relations with the young men whom he had selected for training in surgery. When I view in retrospect my own experience with him it is remarkable what he gave us in the way of opportunities. There was the stimulation of his own work in the wards, the operating room and the experimental laboratory; there was the privilege of assisting him in his various activities and of benefiting from his experience in surgery and from his wide reading and profound thinking; there was the opportunity and always the encouragement to pursue clinical and experimental investigations in the wards and laboratories; there was the necessity of learning a type of surgery almost unique which time has proved to be the only safe kind of surgery; there was the chance to practice this kind of surgery on the ward patients who were practically all turned over to us; and there was the opportunity to gain experience in teaching and in departmental administration. In return we gave him, with few exceptions, our love, affection and loyalty which, because of his own nature, we could not express save by hard work and able performance. This devotion has not diminished with the passing years, but has almost certainly increased. Some there were who failed to appreciate Dr. Halsted and the opportunities he gave them. In my experience there were three such men. Essentially they failed to appreciate his attitude toward surgery and surgical education and permitted their resentment at his undeniably sarcastic remarks to outweigh the opportunities he gave them.

With his colleagues in surgery outside of Baltimore he had in the period of which I speak few contacts. Earlier he had attended the meetings of the American Surgical Association and had given papers concerning his clinical and experimental work; but how intimate he was with members of this association I do not know. Dr. Matas has this to say about it: "His reserve and caution in making acquaintances, his seeming formality, always concealed by the utmost urbanity, made him rather difficult of approach and kept at a distance men, who, fully aware of his great worth and of the privilege of his well-earned national reputation, were eager to meet him but made no advances owing to the impression that Dr. Halsted would not be overresponsive to their attentions." Knowing Dr. Halsted about the hospital I should imagine that Dr. Matas accurately described the situation; for with surgeons who came to

his clinic he was shy, reserved and distant. Some who came from considerable distances failed to see him at all; and they must have felt that he lacked courtesy. To those he saw he was formal but unfailingly courteous; but they, not understanding his nature, must often have wondered whether he had been glad to see them. From my observations of Dr. Halsted, his relation with his colleagues in the profession had two causes—a shy, retiring nature which did not permit him to meet easily men he did not know well, and second, a lack of interest in them. In his later years he tended to miss, for example, the meetings of the American Surgical Association, and when asked about it he complained of the lack of any thoughtful and intelligent discussion. On one occasion, after reading before this body a paper which represented an enormous amount of work and infinite care in its preparation, he returned and told me that not a soul had risen to discuss it, and it was to provoke discussion of an important surgical problem that he had given it. He failed to appreciate that after his own discussion of the problem there was little that anyone might add upon the subject. Again, in his rare visits to other surgical clinics he often failed to see the men one might expect him to see. I recall a trip he made to Chicago when John B. Murphy, A. J. Ochsner and others were the men surgeons went to see and hear. The only men he saw were Karl and Emil Beck and when I asked him why, he replied that they were the only men in Chicago with interesting ideas. Yet he had a few close friends in the profession and with these his relations were apparently the same as with those of his intimate friends in Baltimore. Matas was one of them, and his appreciation of Halsted given at the memorial exercises after his death revealed an unbounded affection and admiration for him. Dr. Halsted had operated upon him in his own home and there Matas remained during his convalescence. He writes: "As I was convalescing in his home I learned to love the sound of his cautious footsteps as he approached my room late at night to assure himself of my comfort and to enquire with parental solicitude into the events of the day. He would sit by my bedside and, relaxing after the arduous work of the day, indulge me with his commentaries on many of the questions and problems in which we were mutually interested."

With many foreign surgeons he seems to have kept in close touch. It was his practice to go abroad in the summer at the close of the school year in Baltimore. He might go to a hotel in Folkestone or Brighton, to the Hotel Continental in Paris, or to some small place on the coast of Brittany and remain in seclusion for several weeks. On his return from Europe he told me about such visits on a number of occasions. He sought rest at Folkestone, the need of which he felt on his journeys, and there, in surroundings he liked, he read and idled for a time before or after his visits to various European clinics. He studied French in Paris and attended the theater in order to improve himself in this language; for though he could carry on a conversation in German, it

was evident when French surgeons visited the clinic that he found difficulty in expressing himself adequately.

Dr. Halsted's relations with foreign surgeons were friendly and many of the distinguished European surgeons, particularly in Germany, knew him well. He writes of his associations with Mikulicz of Vienna and later of Breslau, of Körte in Berlin, of von Eiselsberg in Vienna, of Payr in Leipzig, of Küettner in Breslau, of Enderlen in Würzburg, of Theodore Kocher in Berne, and of René Leriche of Lyons, later of Strassbourg and now of Paris. These were, or are, all eminent surgeons, the professors of surgery in their respective clinics and probably the most important group of contributors to surgery at that period. At the time of my association with Dr. Halsted, Mikulicz had died but he occasionally spoke of him and the men he had trained. The other men mentioned were all living and them he saw and visited their clinics; in addition he visited Martel and Quénu in Paris. He made annual trips abroad in 1910, 1911, 1912, 1913 and two trips in 1914. I cannot recall that he returned to Europe after the outbreak of the First World War. His conversation indicated that he knew these men well and some of them intimately; he knew by name their assistants and was familiar with the work that was going on in their clinics. Indeed, it seemed to me that his reading of foreign literature was simplified in that he knew the productive men abroad so well he could pick and choose in his reading.

Of European surgeons, Kocher most nearly met his ideal and he frequently spoke of him in glowing terms. He visited his clinic in Berne at every opportunity and found himself in sympathy with Kocher's attitude toward surgery and with his technical methods. They had many points in common and there existed between them the warmest friendship. There is a letter from Kocher's son, Dr. Albert Kocher, which describes the relationship between the two men. He spent two or three weeks at a time in Berne, lunched and dined in the Kocher home, and went with them to concerts and festivals. He attended the clinic every day, watched Kocher operate, saw and examined interesting cases and occasionally himself operated before the students, Kocher and his son assisting him. The two men frequently met in Berlin for the German Surgical Congress and there they were inseparable companions. Dr. Albert Kocher says of his father and Halsted: "The two men were somewhat alike in character. [Kocher was intimate with very few.] Both not tall or massive as some surgeons are, but fine, delicate, distinguished looking, very modest and yet very noble, very grand, always kind to everyone, more especially to the patients of inferior classes, and yet very energetic and very severe when important things were at hand."

Of the other surgeons I have mentioned he spoke perhaps most frequently of Küttner and Payr; but he referred to all of them in terms of admiration, to each according to his deserts. On his visits to the men and their clinics he

observed and studied their technical methods in the operating room, the surgical problems with which they were occupied, and their attitude toward surgery as an art and science generally. Enderlen, for instance, whom he visited in 1913 when Enderlen was engaged in attempting experimentally to bridge a gap in the esophagus by various plastic procedures involving segments of the intestine, he thought patient, industrious and clever, but remarked it was a pity that one so gifted should consume his time in experiments almost certainly foredoomed to failure. He thought Kocher's encyclopedia of surgery an example of misdirected surgery.

That Halsted and his clinic in Baltimore enjoyed the respect and admiration of his European colleagues there is no doubt. One has only to read the estimates of him and his work by René Leriche, von Eiselsberg, Albert Kocher, and others to appreciate that Halsted at the time was considered the greatest of American surgeons and his clinic the most stimulating and productive. I came to appreciate this fully when as an exchange assistant I had the good fortune to be sent to Küttner's clinic in Breslau while Landois came to Baltimore. The plan of exchanging men with foreign clinics had apparently been maturing in Dr. Halsted's mind for several years and, no doubt after a good deal of thought, he had decided upon either Payr's clinic in Leipzig or Küttner's in Breslau. He discussed the matter with both men and the first (and last) exchange of men occurred in 1914. I arrived early in June of that year and was enthusiastically received by Professor Küttner and members of his staff. I was assigned a room in the hospital and a surgical ward, and in every respect was made one of the group. I could not have been more kindly treated. It became evident very early that I was looked upon, not as a surgeon in my own right, but simply as the representative of Halsted and his surgery. The eagerness which Küttner and his assistant showed in learning and understanding every detail of Halsted's operations and his technical methods indicated more clearly to me than the many things they said their respect for him and his surgery. The operations developed by him for hernia, cancer of the breast, for diseases of the thyroid gland and for aneurysm were performed by me not once but a number of times, until they were satisfied they understood the philosophy and technics involved; and they did these operations themselves with me as an assistant and coach. They were amazed and delighted with the exposure and dissection of the axilla in Halsted's breast operation, and almost could not believe the size of the skin grafts one can cut with a catlin amputation knife. Though Thiersch, a German surgeon, was responsible for the grafts of which I speak, no one in Germany had developed, as had Halsted, the technic of cutting a graft the size of the palm of the hand. They were skeptical at first of the necessity of Halsted's type of thyroidectomy and, indeed, their own procedure of ligating all the arteries outside the capsule of the gland made the operation much simpler. They said they had not seen

tetany develop in serious form after their operation; but when, having received permission to examine all patients after operation, I was able to demonstrate eight patients with mild tetany in the wards at one time whom they had not examined by the usual tests for tetany, they were convinced that Halsted's reasoning was sound. Not only in general surgery but in the specialties of surgery as developed under Halsted were they interested and keen to learn. I was called upon to demonstrate the technic of brain operations as developed by Cushing, and of the perineal prostatectomy as developed by Young. They had all of Young's special instruments but had not been very successful with the operation. It was interesting that as Young's assistant for a year in Baltimore I had never been permitted to do his operation, but in Breslau I was called upon to do every other case until they were convinced by a comparison of the postoperative results of the merits of the procedure in relation to their own suprapubic method.

The great interest in and admiration for Dr. Halsted exhibited by the Breslau group was matched by an equal interest and admiration shown by visitors to the clinic at the time I was there. In conversations with them it was Halsted whom, of all surgeons, they held in highest regard and it was Halsted's clinic which they considered the most productive in this country. I came home with an increased respect for my chief and a feeling that he was more highly regarded abroad than he was in his own country.

VII. PERIOD 1907–1922

It was with these years in Dr. Halsted's life that I was most familiar, for in the fall of 1907 I began my service as an intern at the Johns Hopkins Hospital. In my student years he was to me and my classmates a very superior being; meeting him on the street about the hospital we raised our hats instinctively while failing often to do so when meeting others. In the surgical wards and at his amphitheater clinics we were all tremendously impressed by his profound learning and his intense interest in scientific surgery. On his ward visits he rarely discussed the symptoms and clinical signs of disease as exhibited by the patient. Rather he found some peculiar detail which aroused his interest: the unusual "feel" of a tumor, some unusual distribution of blood vessels, some lengthening of a bone, some peculiarity in a roentgenogram. These he studied and commented upon before us while we stood about, impressed by his interest and the fertility of his suggestions, but often wondering what it was all about. To him they were problems; and that he carried them away with him was evidenced by the fact that months later, after reading and thinking about them, he again referred to them and offered his explanations. His attitude toward ordinary diseases as contrasted with that of others about him is well

illustrated by my oral examination in surgery as an undergraduate student. I had three patients to examine, one of whom, a man, had a sarcoma of the tibia. I examined the patient, was pleased that I could make a diagnosis, and passed on to the remaining patients upon whom I spent more time. I was called into Dr. Halsted's office and entered with some confidence. Looking at my card to verify my name, Dr. Halsted said, "Heuer, what do you suppose caused the lengthening of that man's leg?" I was at a complete loss for I had not noticed that it was longer and, therefore, had not thought to measure it. He said, "Did you measure the leg?" and I confessed I had not. "Why, we [editorial] spent twenty minutes measuring the leg," he said; whereupon he rose, opened the door and ushered me out of his office. No other questions; and my despair may be imagined. I confirmed the fact that the patient had been seen by several distinguished members of the senior surgical staff in our outpatient department and hospital. None had noticed the lengthening of the tibia, none had measured it. They had been content, as I had been, with the diagnosis of sarcoma, a diagnosis which to Dr. Halsted was so self-evident that he did not even question a medical student about it.

In the years between 1907 and 1911 my contacts with Dr. Halsted were fairly frequent but in no sense intimate. My activities for a good part of the time were directed away from general surgery. In my intern year Harvey Cushing often demanded my services, and I spent a good deal of time giving anesthetics for or assisting him in his operations on the brain. The illness of Ortschild during this year caused my transference to the private service at a time when Hugh Young was establishing his record of 125 perineal prostatectomies without an operative fatality. He, and his patients, required a great deal of my time; and between him and Cushing, both very demanding individuals, there was little opportunity to assist Dr. Halsted in the operating rooms. Having been given in September, 1908, the choice of serving as Cushing's special assistant in neurosurgery or as an assistant resident on Dr. Halsted's staff, I chose the former and spent one entire year in neurosurgery. In September, 1909, it appeared that my surgical training at the Johns Hopkins Hospital was at an end; for not having accepted the position Dr. Halsted had offered, he had filled it and there were no vacancies on the resident staff. But later in the year the resignation of Louis Reford gave me the opportunity I cherished of continuing my training under Dr. Halsted. I have always felt that I owed my good fortune in returning to Dr. Halsted's staff in part to Dr. Henry Hurd, then Superintendent of the Johns Hopkins Hospital. He covered by a crotchety exterior a very kindly nature. When he heard that I was out of a job he called me to his office, questioned me about my hopes for a career in surgery, and told me I might live at the hospital until something turned up. This offer I gratefully accepted. He did many kind deeds for young men about the hospital, few of which ever became known. A rather forbidding man

because of his caustic tongue, he had a keen sense of humor. Our almost yearly audience with him—a delegation of which I sometimes was the spokesman—coming to complain of the hospital food was always amusing. He never refused to meet us, always greeted us courteously, and did not by word or action suggest that he knew the purpose of our visit. On hearing our complaints he always used the same technic. Pointing to each of us in turn he asked how many pounds we had gained the past year. Rather sheepishly we all admitted to a gain of from five to twenty pounds which, because of the sedentary life and additions to our diet on the wards and outside the hospital, was easily understandable. On hearing the report of all the men—I do not recall an instance of loss of weight—he rose from his chair, bowed to us and said, "Good morning, gentlemen," and we filed out, never having been given the opportunity of discussing the quality of the hospital food.

At the time of my return to Dr. Halsted's service Churchman was resident surgeon and Remsen first assistant resident. I followed these men and succeeded to the residency in surgery in September, 1911. My more intimate association with Dr. Halsted began at this time.

It may be interesting to describe the surroundings in which Dr. Halsted at this time was active and note the associates with whom he came in contact. As compared with its present appearance, the Johns Hopkins Hospital was then quite different. The large solid building on Monument Street had not been built nor had the present medical and surgical ward units. The surgical building, the outpatient department, the Phipps Tuberculosis unit and the pathological building took the place of the present solid building. An octagonal ward building, one of the unique features of the hospital, stood in place of the present surgical wards while a single ward building occupied the site of the present medical unit. The surgical ward beds were rather scattered; the main men's surgical ward was the second floor of the octagonal building, Ward D, which housed about sixty patients. Above it was a mixed medical and surgical ward, Ward E, the beds in which were distributed equally among the medical and surgical departments. East of Ward D was Ward F, a man's medical ward; east of Ward F was Ward G, a combined medical and surgical women's ward, housing fifty patients. Still further on was old Ward I, an infectious ward, beds in which were available to surgery for such serious conditions as tetanus, erysipelas and other dangerous infections. Further on and forming the east end of the series of ward buildings were Wards M and O which housed male and female colored patients.

The x-ray department, which at that time functioned more or less under the surgical department and was directed by Harry Baetjer, was located on the second floor of the surgical building as it then existed. The surgical pathological laboratory under Joseph Bloodgood also was housed in the surgical building and was an intimate part of the surgical department, not of the de-

partment of pathology. The laboratory of experimental medicine and surgery, called the Hunterian Laboratory, was a separate building diagonally across the street from the east end of the hospital, placed among the buildings of the medical school. Its surgical division was, at the time, directed by Harvey Cushing, soon to leave to accept a professorship of surgery at Harvard. The surgical outpatient department was housed in a building just east of and connected with the surgical building. The private patient buildings were two, one each at the north and south ends of the hospital group facing Broadway. The north building housed male patients, the south female. It will be observed that the physical plant was rather rambling, scattered over a wide territory and requiring considerable walking every day to cover it.

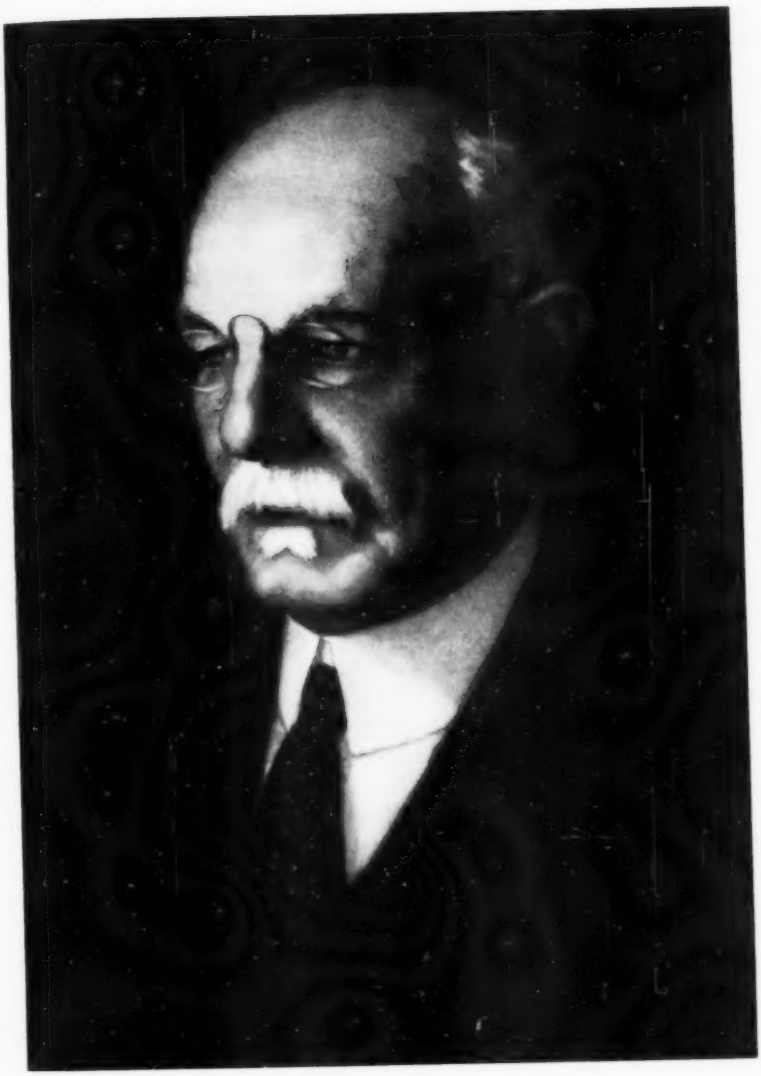
Halsted's colleagues at this time were a distinguished group. In anatomy Mall had long been a close associate, to be succeeded at his death by Weed. Howell was professor of physiology, Abel of pharmacology and Welch of pathology. In medicine Osler had been succeeded by Barker. Kelly was professor of gynecology, Williams of obstetrics and Meyer of psychiatry. Not only were these men of unsurpassed distinction in their various fields but each had surrounded himself with associates of rare ability. It would be difficult to find gathered together in one institution at any time in American medicine a group like Halsted, Finney, Cushing, Young, Bloodgood, Baer, Baetjer, Follis and Fisher in surgery; Barker, Thayer, Futcher, Hamman, Boggs and Sladen in medicine; Kelly, Hunner, Casler and Richardson in gynecology, Williams and Slemmons in obstetrics and Welch and Winternitz in pathology. They were responsible for the preeminence in medicine which the Johns Hopkins Hospital and Medical School then enjoyed.

There permeated this group and the institution they served the highest ideals with respect to the care of patients and the greatest enthusiasm in teaching and in the prosecution of scientific research. The hospital was rather small at the time, so that we all knew what was going on in our own and in other departments; and without an attempt to explain it, there developed in each young man who became identified with it the desire to make a contribution to medical knowledge. No better proof of this is needed than that obtained by following the careers of the younger group of men selected for the resident and intern staffs. An example is furnished by the subsequent careers of the men associated with me on the resident and intern staffs during my period as resident surgeon (1911–1914). Of these men Gatch became Professor of Surgery and dean of the medical school of Indiana University; McClure became surgeon-in-chief of the Henry Ford Hospital; Dandy became Professor of Neurosurgery at Johns Hopkins and contributed greatly to this field, and Reid followed me as Professor of Surgery at the Cincinnati General Hospital.

It was in these surroundings that Dr. Halsted was at the time active. He was in 1911 fifty-nine years old. His own reputation and that of his surgical clinic

had been well established. He had long since made important and fundamental contributions to surgery on the basis of which the technical methods used in his operating rooms had been founded. The resident system, his great contribution to the training of young surgeons in this country, had been in operation for many years and had produced some brilliant men. The surgical teaching was organized, the ward service and the various laboratories were functioning smoothly. A little tired, not overly well, at fifty-nine he might justifiably have felt that he deserved to rest on his oars, leaving the active work of his clinic to his younger associates. This, to a great extent, he did, but not with the idea of resting. While he left the routine surgical work to others, he was unquestionably the dominant figure in the clinic, actively engaged in the study of problems presented by patients, eagerly pursuing research work in the laboratory for experimental surgery and stimulating, by his interest and his own example, the scientific work of his younger associates.

The portrait by Becker reproduced here and now in my possession is, the best likeness of him at this time. Rather short and stocky, he had a sturdy frame and walked with vigor. His shoulders were those of a previously powerful man, his arms long, his hands for one of his size unusually large. The most interesting thing about his hands was the unusually short terminal joint of his thumb which gave to this digit an unusual appearance. Sargent must have noticed it at once for in the painting of "The Four Doctors" Halsted's thumb is emphasized. He had an interesting face which Sargent also picked out and exaggerated. He had rather small light blue eyes with a twinkle in them when amused. His forehead was sloping, his head bald with a fringe of grey hair. His ears were noticeably large and prominent and projected outward from his head. It paid us to observe them, for when they became red with a slightly bluish cast at their tips, it was a certain sign of his irritation with the quality of our assistance in the operating rooms. His nose was fairly prominent and always supported rimless eye glasses. His mouth was concealed by a white, rather droopy mustache which was always slightly stained by nicotine. He wore a small goatee under his lower lip. The skin of his face was somewhat saggy and of rather a high color. Unquestionably it was an interesting face which I studied for years without being able satisfactorily to interpret it. Amusement was indicated by the twinkle in his eyes and a fleeting smile. I never heard him laugh outright. When you spoke to him he looked at you directly and with concentration as if what you said was of the utmost importance; but you could not be sure from any change in his expression what he really thought of you or your remarks. His intense gaze was one of the reasons for the discomfort which his staff suffered in his presence. I cannot recall that I ever saw him angry; or if he was, he failed to show it by the usual signs of anger.



Photograph of a portrait of Dr. Halsted now in the possession of G. J. H. It was painted by Hermann Becker, one of this group of artists brought to this country by Howard A. Kelly. It is by far the best likeness of Dr. Halsted that I know of.

GEO. J. HEUER

His days at the hospital were varied. When he operated or held his weekly ward visit with the students he arrived at 9 o'clock in the morning and might spend the entire day at the hospital; otherwise he arrived at about lunch time, having spent the morning at home reading or writing, or in the Hunterian Laboratory engaged in his experimental work. Perhaps I might best give you a picture of him by describing the organization of the surgical clinic and having you accompany me as he functioned within it.

VIII. DR. HALSTED IN THE OPERATING ROOM

At the time of which I write the departments of surgery and of gynecology and obstetrics each had its own operating rooms in different parts of the hospital. The operating rooms of general surgery were on the top floor of the old surgical building. They were few and their arrangement simple. At the east and west ends of the building facing north was an operating room of generous size; between them was the surgical amphitheater; Dr. Halsted and the resident staff used the west operating room, Cushing, Young and other specialists used the east room. Dr. Finney gave his Friday morning operative clinics in the amphitheater and Dr. Halsted his weekly dry clinics in this room.

The equipment of Halsted's operating room was very modest. The operating table would seem impossible to the young present-day surgeon. It consisted of an oblong metal basin which measured approximately 6 feet in length, $2\frac{1}{2}$ feet in width and 6 inches in depth, supported at its corners by four metal legs. At either end of the basin was a movable triangular wooden block upon which rested a metal stretcher covered with a rubber pad. The arrangement was such that during copious irrigation of the operative area or wound with fluids, the overflow ran off the edges of the stretcher into the basin of the operating table and from there into a pail hung under a hole in the middle of the basin. Upon this table "clean" and "dirty" cases were subjected to operation, sometimes of necessity alternately. If the surgeon wished the head or the foot of the table elevated during operation, the orderly raised the metal stretcher, patient and all, and placed a wooden stool under it into the metal basin. In addition to the operating table there was a long curved glass-top table for instruments and a small metal stool for the anesthetist, a nurses' dressing carriage, and a table for basins containing antiseptic solutions. An observers' stand with three tiers of steps which could be moved from place to place and from which students and visiting surgeons observed operations completed the equipment. There were no special lights for illuminating the operating room such as we use today. There was nothing, of course, like air-conditioning, regulation of moisture and filtration of the air in the operating rooms. There were no electric surgical units or other complicated machinery which now seem almost to clutter up our operating rooms.

The surgical technic varied from that in common use today. Operating room linen (sheets, gowns, towels) was, as is customary today, sterilized by steam under pressure. Instruments were boiled for ten minutes; if they had been used on an infected case for fifteen minutes. During my earlier years at the hospital the instruments, after being boiled, were placed in shallow basins containing 1–30 carbolic acid solution, this last to prevent contamination of the instruments from the air. Silk suture material was boiled ten to fifteen minutes; sterilized suture material could, at the time, be secured from manufacturers, but at first a large part of that used was prepared and sterilized in boiling oil by the nurses. The rubber gloves were far heavier than those now in use, were beautifully made, more durable, and less likely to be torn during an operation. They were sterilized by boiling, then transferred to a basin containing 1–1000 bichloride of mercury solution. The surgeon in cleaning his hands and arms up to his elbows scrubbed with a stiff brush with soap and water for from five to ten minutes; then immersed his hands and arms in a saturated solution of potassium permanganate which stained them a chocolate brown, then dipped them into a saturated solution of oxalic acid which oxidized the permanganate and returned the skin to its normal color; and finally soaked his hands and arms for five minutes in a basin of 1–1000 bichloride of mercury solution. It was a rather drastic method and very hard on the skin of some surgeons and nurses, who developed an annoying dermatitis. The skin of the patient at the site of the operation was treated in the same way, the last step in the sterilization consisting of rather prolonged scrubbing of the skin with quantities of 1–1000 bichloride solution. Later in my career the technic changed gradually. Dr. Halsted was one of the first to use alcohol for his hands instead of the sequence of permanganate, oxalic acid and bichloride; and iodine was used for the sterilization of the skin of the patient. The "wet" technic of gloves was continued even though in other clinics it was replaced by the "dry" technic; that is, sterilization of gloves by steam and putting them on dry with sterile powder. The immersion of instruments in carbolic acid solution was abandoned. It is interesting to note that infections were rare even though in many instances clean cases followed dirty ones.

During my internship and immediately after, inhalation anesthesia was quite primitive. Dr. Halsted himself had developed local anesthesia with weak solutions of cocaine and this was not infrequently used. Chloroform was rarely employed except occasionally by Cushing. Ether was the anesthetic of choice and in my early days was administered by the interns. As interns we were taught anesthesia by the operating room orderly, Owen. He gathered us around him, demonstrated the administration of ether on patients, and told us the significant facts regarding the patient's respiration, the size and mobility of the pupils, and the lid reflex. Ether was administered with a cone made of pasteboard and covered with oiled silk and a towel. In the apex of the cone was a sea-sponge on which the ether was poured. It was a barbarous method.

After the patient had been strapped to the operating table the cone, containing usually a strangling dose of ether vapor, was clapped over his nose and mouth. There was often a period of struggle before the patient succumbed to the ether vapor; and during this period of struggling orderlies, doctors and nurses might have to cling to arms and legs to keep him on the operating table. Owen was an adept in renewing the ether in the cone. Watching the patient's respiration he snatched the cone from the face during expiration and had the sponge soaked with ether and the cone back in place over the patient's face before inspiration began. This technic we all tried to master.

During my early years Dr. Halsted was highly dissatisfied with the methods and the administration of inhalation anesthesia. He tried to get men on his resident staff interested in anesthesia, and from time to time had an assistant resident instead of an intern administer the anesthetic to the patient he operated upon. Finally Gatch came along as a member of the resident staff. Nitrous oxide-oxygen anesthesia was just being introduced, and Gatch became interested in anesthesia and devised one of the early machines for administering nitrous oxide-oxygen anesthesia. The cone method of giving ether was replaced by the "open drop" method. Cushing began to employ a trained anesthetist in his private cases; and the trained nurse anesthetist appeared in the operating rooms of whom Miss Margaret Boise was the first. With these developments and with the further perfection and extension of the use of local anesthesia, all of which occurred during my period at Hopkins, anesthesia at the hospital was vastly improved.

It was in such surroundings and under such conditions that Dr. Halsted operated and developed the technical methods which have made him unique in American surgery. He did not operate often. It was rare that he operated as often as three mornings a week and he almost never operated upon more than one patient in a morning. During my period with him the kind of operation he performed was largely limited to the conditions in which he was at the time interested. His most frequent operation was for exophthalmic goiter, but he also operated for cancer of the breast, aneurysm of the large arteries, which necessitated entering the thorax and abdominal cavity, for gallstones, particularly in the common duct, occasionally for hernia, and for conditions requiring intestinal resection and suture. He was the first, as far as I know, to insist that the surgeon and his assistants completely change their street clothes before operating; and therefore he appeared in the operating room in a freshly laundered white duck suit with short sleeves, white tennis shoes and a white skullcap. His mouth and nose, like those of his assistants, were covered with a gauze mask.

In "scrubbing" for an operation he spent rather less time than did his assistants. In the earlier period of my association, assistants and operating room nurses used the technic with permanganate, oxalic and bichloride I have described, while he went to his special basin of alcohol and scrubbed his hands

with a sterilized wash cloth. The operating room nurse assisted him in putting on his gloves. With her gloved hands she folded back the cuff of the glove, placed her hands under the fold and stretched the cuff so that Dr. Halsted could slip his hand into it. By this technic Dr. Halsted's bare hands never came in contact anywhere with the outside surface of the glove or touched the nurse's gloves. His attitude toward the whole matter of the surgeon's hands in relation to aseptic technic was different from that of many of his contemporaries. They were inclined to assume that the skin of their hands had been rendered sterile and that rubber gloves were simply an additional safeguard. Dr. Halsted's attitude was that the hands were "dirty" in spite of the treatment given them and that an intact rubber glove was the main protection of the patient. The effect of this teaching is obvious. Gloves were immediately changed if only punctured by a fine needle point. He himself was most insistent about this. Assisting him, I occasionally got in his way and he stuck me with the point of his knife or with a needle. "Oh, Heuer, did I stick you?" he enquired, and on my answering him, "Yes, sir," he said, "Give me another knife" and I dropped out to change my gloves. All this is, of course, commonplace today; but at that time in observing surgery in other clinics I saw no one who was so careful with respect to the hands of the surgeon, assistants and nurses.

The skin of the patient was of equal concern to him. The elaborate preparation of the skin in the operating room often astonished visiting surgeons; not infrequently, in special cases, the preparation had begun three days before in the wards with daily washings and alcohol compresses. He was the first, I believe, to cover the skin of the operative field so as to protect the wound from possible skin contamination. All sorts of methods were tried. After the usual sterilization of the skin it was dried with alcohol and ether and covered with a sheet of sterilized china silk dipped in collodion. This, when the collodion dried, made an impervious adherent covering through which the incision was made. Sheets of thin rubber were also used and stuck to the skin with a sterile cement. Such precautions indicate his efforts to cope with the problems of skin sterilization.

At the operating table Dr. Halsted was a slow, painstaking operator. At a time when many of his contemporaries considered speed an essential feature in the success of an operation, he operated slowly, carefully, with a minimum amount of injury to tissues, with the least amount of pulling and hauling on tissues and organs, and with the smallest amount of hemorrhage. In a large operation such as that for cancer of the breast, as many as two hundred or more artery forceps were applied. This was the job of the first assistant; and nothing irritated the Professor more than to have him grasp and crush in the jaws of the forceps a large mass of living tissue. Many of these forceps could later be removed without tying off the bleeding points; the points which required ligation were tied off with very fine black silk.

When one reviews Dr. Halsted's performances in the operating room it seems

in retrospect that one was less impressed with his skill and dexterity as an operator than with the technical methods which he developed and followed, and which are now recognized to have made surgery far safer for the patient. Yet in some respects he was a beautiful operator. His long sweeps with a scalpel which laid bare the carotid artery and jugular vein of the neck, his dissection of the axilla in the operation for breast cancer, his exposure of the thyroid vessels in goiter operations, his dissections of blood vessels in operations for aneurysm, were all masterful performances and showed that he was at his best in operations requiring a knowledge of anatomy and the art of dissection. He was less at home in the abdomen; and although he made important contributions to, and remained greatly interested in, resection and anastomosis of the stomach and intestines, while I was with him he rarely operated for conditions requiring such procedures.

His poise in the operating room was marvelous. There occasionally occur, in spite of the greatest care, sudden unanticipated complications such as copious hemorrhage, which try the surgeon's courage and resourcefulness. In the presence of such events Dr. Halsted never became flustered, never showed even by a bead of perspiration on his forehead that he was disturbed. I recall assisting him at an operation for aneurysm of the abdominal aorta at its bifurcation, before a distinguished group of German surgeons. His plan was to surround and tie off the aorta above and below the aneurysm and remove the aneurysmal sac. Everything was going well and he had tied off the two common iliac arteries when, in attempting to pass a tape around the aorta above the aneurysm, the aneurysm needle must have torn a great hole in the diseased artery. There was an enormous gush of blood which filled the wound. In a second I had plunged my hand into the abdomen and by good fortune got my finger on the aorta and compressed it so as to stop the bleeding. Murmuring so that the bystanders could not hear, "Heuer, I fear we are in trouble," he calmly turned to the German surgeons, explained what probably had happened, then began to free the aorta above the place where I was holding it. He got a piece of tape around it and tied the tape; but the wall of the artery was so diseased that the tape cut through it. Again there was an imposing hemorrhage, and again I managed to secure the aorta with my fingers. Apologizing to the German surgeons for the difficulties he seemed to be having, he again freed the aorta higher up and succeeded in tying it off at the level of the renal arteries. He then removed the aorta from the renal to the common iliac arteries including the aneurysmal sac. It was as slow, careful, deliberate and neat as his usual operations; and throughout it he did not appear in any way upset. The German surgeons were vastly impressed. One of them, congratulating me on my assistance after the operation, said: "I haf had a new experience. I haf seen the aorta opened and the man yet lives." The patient, however, died within forty-eight hours, and it was found that the proximal ligature around the aorta had occluded one and probably the other renal artery.

Dr. Halsted expected a great deal of his assistants in the operating room, and failing to get good assistance could be so bitingly sarcastic as to shrivel completely those with him at the operating table. I have sometimes told my own residents when they seemed awkward in assisting me that they have no idea what a good assistant should be in Halsted's sense. In doing a breast operation, for instance, he proceeded to cut with his knife, and if he could help it, never paused to clamp a bleeding vessel, but expected his assistants to follow him so rapidly and so dexterously that there was not only no loss of blood but also no crushing of large masses of tissue. In addition he expected them to keep the wound unstained with blood, to anticipate and provide exposure without undue retraction, and to be, in any procedures he undertook, a part of his brain and another pair of hands. If such assistance was provided he was a delightful and inspiring man to work with; if not, he could be, in a quiet way, very unpleasant to those upon whom he vented his irritation. He never raised his voice in the operating room, never swore, as was then common in other clinics, and never threw instruments about. On the other hand, he might lean over to his anesthetist and say, "Of course, Dr. X., you appreciate, don't you, that this is not anesthesia, it is asphyxia;" or he might, with an assistant who was making heavy weather following him, deliberately pause in the operation, watch his awkward efforts to clamp a bleeding artery, confuse him utterly by repeating "Catch it, Y., catch it;" then saying to the instrument man, "Give me a clamp" and himself catch it with unerring accuracy.

As might be expected, there were among the residents who were given the unusual opportunity of training under Dr. Halsted those who feared him and hated to assist him in the operating room; others who, though always a little fearful of him, enjoyed their association with him as his assistant. As I review these men and their subsequent careers I see that it was the men who worked hard and perfected themselves as assistants, who familiarized themselves with his problems, who assisted him with his experimental work, and who themselves were able surgeons and who followed his technical methods—it was these men who got on well with the Professor in the operating room, for they gave him the kind of understanding assistance which the others did not. It is clear that Dr. Halsted could tolerate only superior work, was impatient with anything less. The result was to stimulate the best men to their greatest efforts, an attribute of a great teacher.

While Dr. Halsted did not operate often he had the habit of dropping in to the operating rooms to see what others were doing. It was at such times that the extraordinary effect he had upon the members of his senior staff and residents became apparent. Of the members of his senior staff only Finney, Cushing and Follis appeared at ease and comfortable; but I am not sure they actually were. The others were uncomfortable in his presence, began to perspire, and were apt to do less well than if he were not there. This was remarkable when one considers that some of the men were nationally and even internationally

known surgeons. His "What are you doing, X.?" was of course always followed by the surgeon's attempt to explain his procedure and to show him the operative field. His deliberate change of nose glasses (he carried several pairs in his waistcoat pocket), his intent look first at the operator, then at the wound, his occasional question which the surgeon usually could not answer, or his total lack of comment to indicate whether or not he approved—this was all that usually happened. Yet one observed beads of perspiration appear on the foreheads of these surgeons, saw their confidence in themselves lessen and the performance of the operation become less assured. A murmured "Thank God" sometimes accompanied Dr. Halsted's tiptoed exit from the operating room. I have, for instance, seen Young, a master of the operation of perineal prostatectomy, perform rather badly in the presence of Dr. Halsted, and later in the dressing room throw his perspiration-soaked operating suit on the floor, stamp on it, curse roundly and ask, "Why can't I get over this feeling of inferiority when the Professor is around?"

Dr. Halsted surely was aware of the effect he created, for he was too keen an observer not to see what was apparent to others in the operating room. He never referred to the matter to me, although once or twice in the later years of my association with him he indicated with a nod toward the operator and a wink that he was aware of his discomfort. I am not sure that he did not enjoy on some occasions the discomfiture he caused. On the other hand he could be, when one was in serious trouble, most understanding and considerate. On one occasion I was performing an operation for removal of an hypophyseal tumor. I had exposed the tumor and found that the right internal carotid artery was surrounded by it. In spite of my care during the delivery of the tumor, I tore the artery completely across, flush with the skull. There was, of course, an immediate copious hemorrhage, fatal if not checked. I inserted my finger into the wound between the brain and the skull at the point where the artery perforated it and stopped the bleeding. There I stood in an awkward position, my arm becoming cramped and beginning to tremble, thinking what next I should do. At that moment Dr. Halsted entered. Immediately, sensing the situation, he asked, "In trouble, Heuer?" and I told him the situation in which I found myself and asked his advice. He said: "I'm sure you will do better without me and my suggestions; good luck," and immediately tiptoed out of the room. His first question the next day was to ask what I had done; and I told him I had called Roy McClure, then first assistant resident, who had ligated the internal carotid in the neck, while I held on, and stopped the hemorrhage.

While I cannot recall that Dr. Halsted ever voiced his disapproval of the work of members of his senior staff in the operating room beyond an occasional mild suggestion, he did strongly disapprove of some of the senior men associated with him. It is true that there were some men who either did not realize the

importance of his technical methods or were unable to master them. In a clinic in which gentleness in handling living tissues, refined methods of controlling hemorrhage, and rigid aseptic technic were preached, they remained rather rough in their methods. In my later association with Dr. Halsted and after one of his visits to the operating room he referred to these men, regretting that it was too late to teach them and emphasizing to me, should I ever have charge of a clinic of my own, the importance of never appointing a man to an important position until certain of his qualifications as a surgeon. With his resident surgeons his attitude was different. Observing them at work in the operating room, he did not hesitate to express disapproval of their judgment or of their technical work, and on rare occasions he was very severe. I recall, as a junior assistant, his criticising the resident surgeon unmercifully for an operation which revealed not only poor judgment but miserable performance, and his telling the man that he could not operate upon another patient for a period of six weeks. When one recalls the unique position the resident held in the hospital, his age (usually over thirty), the years he had spent in training, and the assumption that his first assistant was better qualified to care for patients than himself, it is difficult to conceive of a more bitter punishment.

IX. DR. HALSTED ON THE WARDS

Dr. Halsted left the routine care of patients on the surgical wards to his resident surgeon. It is customary these days for the head of a department to assign to senior associates the supervision of the care of patients in certain wards—in other words, to place responsibility upon the senior men rather than directly upon the resident surgeon. This was not the case at the Johns Hopkins Hospital during Dr. Halsted's time. While it is true that specialists in surgery, like Cushing in neurosurgery, Young in urology, and Baer in orthopedic surgery, had the privilege of sending into the wards a limited number of patients and caring for them, a similar privilege was not accorded the general surgeons. The patients in the wards were Halsted's; and it was understood that unless he especially designated patients upon whom he wished to operate, the patients were the resident surgeon's. This arrangement made the position of resident surgeon unique in surgery in this country at the time of which I write; it placed great responsibility upon him; it could make him very independent and self-assured if he were not the right sort of person. The attempt to introduce the resident system in other clinics has been met with great opposition, largely because the surgeons associated with these clinics feared this relationship would be established. In the fifteen years of my association with Dr. Halsted I cannot recall that a resident surgeon failed in a proper attitude in respect to his position and its responsibilities. He sought advice and consultation when in diffi-

culties from Halsted, Finney and others on the senior staff; nor did he, as has often been stated, adopt an arrogant attitude toward his seniors.

Under the arrangement which obtained, the relationship between Dr. Halsted and his resident surgeon was such that the latter could not escape his responsibilities for the care of patients on the wards. He not only had to see every day and know intimately the diagnosis, treatment, complications and prognosis of every patient, but he was held accountable for every untoward complication which arose. The Professor had a disconcerting way of testing the knowledge, and the honesty of his resident staff; and his sudden inquiry, for instance, as to the blood count of a patient he had seen three or four days before made it necessary for the resident either to know and remember all details regarding his patients, or to admit he did not know, or to make an untruthful answer. The last Dr. Halsted could not endure; and the men caught in an untruthful answer were very likely to be removed from the resident staff.

Dr. Halsted's visits to the surgical wards were not frequent or comprehensive. He had one fixed morning a week during the school year when he made rounds on one or several wards with the undergraduate students. His visits otherwise were erratic and depended upon his health, upon the work he was at the time engaged in, or upon the problems of the resident surgeon. At times a week or more might go by without his appearance at the hospital. At such times he either was not well or was engrossed with work at this home or in the laboratory. On the mornings he operated he was accustomed after the operation to see his private patients and such ward patients as the resident requested him to see; on other days, arriving at the hospital at lunch time, he sent for his resident and saw such patients as the resident thought he should see, or those in whom he thought Dr. Halsted would be interested. The latter patients were rare or unusual cases or those who presented conditions upon which Dr. Halsted was at the time working in the laboratory or at home. They included all cases of aneurysm or other abnormalities of the blood vessels; goiters, cancer of the breast, and so on, the seeing of which might include a visit to several wards, the x-ray department and the surgical pathological laboratory. These visits might consume fifteen to thirty minutes, or might require one to two hours. Except with students he rarely went from bed to bed in the wards; rather he assumed that his resident would call his attention to patients who were not doing well or who presented some interesting condition. Some he examined only casually and by his attitude showed his lack of interest; others presented some abnormality which aroused his interest and these he examined in the minutest detail. He rarely dictated a note regarding such examinations, but expected the resident to incorporate his observations in the history. It was understood that these patients he saw were his and were not to be operated upon by the resident until he indicated he did not himself wish to operate upon them; the result sometimes was that the Professor forgot them, the resident hesitated to

remind him of them, and the patients remained long on the wards before receiving treatment. It was a mistake to believe that the Professor would not sooner or later recall them; for if a resident, succumbing to the entreaties of the patient or believing that Dr. Halsted had completely forgotten her, did the operation himself, inevitably Dr. Halsted would refer to her again and say he had been studying the proper treatment.

His ward visits other than his student rounds were informal and were made chiefly with his resident surgeon. The latter managed at times to get word to one or more assistant residents that Dr. Halsted was on his way to the wards. Some who appreciated the value of seeing Dr. Halsted at work, of hearing his comments and his fertile suggestions, hastened to the ward in order to be present at his visit; others, fearing the embarrassing questions which he might ask or the sarcastic remarks he might make, found some good excuse why they could not attend. I frequently wondered why more members of his staff did not follow him on his rounds; I wondered also whether Dr. Halsted noticed the lack of following. I doubt it; and he certainly made no reference to it. He never had formal staff rounds, an exercise common in hospitals, at which members of the senior and junior staffs attend their chief on the wards for a discussion of patients and their problems. Soon after the completion of my residency at the hospital I was sent to the surgical clinic of the University of Breslau as an exchange assistant and had the opportunity of comparing the formality of the German professor of surgery (Professor Hermann Küttner) with the informality of Dr. Halsted. The coming of Küttner to the clinic was announced by a loud gong which rang on every ward, whereupon every man dropped what he was doing, put on an immaculate white coat, and hastened to the foot of the stairs leading up to his office. We lined up in a row on either side of the staircase at rigid attention. Professor Küttner, himself in an immaculate white coat and looking neither to right nor left, without a word of greeting to his staff marched through the two lines of his assistants and on to the wards. In twos we dropped in behind him, followed him to the wards and there listened to his discussions of his patients. Knowing Dr. Halsted's shyness, his embarrassment at being the center of anything, one cannot conceive of a similar performance at the Johns Hopkins Hospital. Indeed, simple staff rounds such as are now conducted in our hospitals would have bored Dr. Halsted excessively. To be the center of an admiring group, hanging upon his every word, would be the last thing he would wish.

On his visits about the hospital his actions, his conversation and his deportment varied greatly. At times he was all business; he saw his patients, did his work, spoke little and left the wards promptly. At other times he was a most delightful and instructive companion. Showing the keenest interest in the patients he saw, he was full of ideas, found a problem in every patient, discussed ways of solving them and urged us to take them on. On our walks from ward

to ward he referred to some important article he had read, or discussed some new aspect of a problem on which he was working. At such times he might be in a playful mood, perhaps at the expense of his associates. Going to the x-ray department to see roentgenograms of a patient he had just examined in the wards he would be met by the chief. Harry Baetjer, a little flustered, would place a film in the viewing box and say, "This, Dr. Halsted, is an x-ray of the skull," and before he could proceed, Dr. Halsted would say in a voice which suggested astonishment at his own acumen, "You know, that had occurred to me also, Baetjer." Or going to the surgical pathological laboratory where we wished to see a specimen, Dr. Bloodgood would hold up a water color and say, "This, Dr. Halsted, is a painting of a breast," and Dr. Halsted, again quickly interrupting, would say, "You can't mean it, Bloodgood." Obvious and rather foolish remarks on the part of his associates, eminent in their own field, were the result, I am sure, of their discomfiture in his presence; and he occasionally seemed to take delight in confusing them still further by his own quick and embarrassing remarks.

His ward visits with his undergraduate students were unlike anything I have observed in other surgical clinics. At times he consulted his resident as to the material available for teaching; at other times he came to the wards without previous consultation with his resident and accepted the patients selected or found his teaching material in going from bed to bed. It could not be foretold what he would discuss. His resident, himself wishing to hear Dr. Halsted discuss a certain subject, might assemble a group of patients illustrating, for example, gallstone disease. It might be brought out in the first patient presented that one leg was shorter than the other. Dr. Halsted would ask to see her legs; and oblivious of the students gathered around him he made the most meticulous, time-consuming measurements of the legs to determine why one was shorter than the other. Questions concerning "'apparent" and "real" shortening, the influence of adduction and abduction upon measurements, the anatomical points for measuring the lengths of various bones of the legs, might be asked the students or might not. The hour would pass; the question of gallstones would not be raised.

With the patients in the public wards Dr. Halsted was always courteous and thoughtful. He was never rough in speech or manner, never exposed a patient unnecessarily, always listened and appeared interested in their problems. They reverenced him as the great professor. He never exchanged pleasantries or jokes with them but was reserved and rather distant in his manner. I have often had the feeling that he was not really interested in them as human beings but rather as scientific problems. As such he was keenly interested in them and in their treatment gave a great deal of time to reading and thinking. He was aware of the great difference between his and their intellectual capacity; and he rarely discussed their condition and its operative treatment with them, as-

suming that they trusted his judgment. He was wont to say that patients could have no conception of what the surgeon did for them.

With his private patients his relationship was, in my experience, unique, interesting and sometimes amusing. He expected much more of them than he did of ward patients. Fastidious as he was with his own person, he was quick to notice the lack of it in others. A well-known lady, prominent socially, came to see him with an abdominal condition. He examined her abdomen at length, then left her room. On his way to his office he said to me, "Why, Heuer, she has a dirty umbilicus;" and although he operated upon her he showed no further interest in her and almost never visited her after operation. He expected the proper relations between surgeon and patient to obtain. The attitude of some patients that a surgeon is a mechanic to whom they come to have a part repaired he could not tolerate. Regardless of the prominence of the patient, it was proper for him to consider it a privilege to have Dr. Halsted see and treat him; and he treated him in his own way and at his own time. An illustration of his insistence upon this relationship was the case of a nationally known woman who had a condition which, over a period of years, required repeated operations. Her coming was announced by Dr. Halsted over the telephone saying: "Heuer, is that you? I just wanted to say that we are in for a bad winter. Good night." And I knew that this particular patient was coming and that I faced a stormy time. She was a forceful, domineering woman, accustomed, in her position, to giving orders and having them instantly obeyed. She arrived at the hospital the first time with her own bed linen and coverings. The place at once was in a turmoil. The superintendent was sent for, men came to install a special telephone so that she could conduct her affairs by long distance, special food was ordered, special nurses were selected and so on. From the exalted position of resident surgeon I was, in her opinion but not in my own, advanced to that of her personal physician to be in attendance at all times. Indeed I once got a severe tongue-lashing for daring to leave the hospital for an hour while she was a patient in it. After waiting a day for things to quiet down, Dr. Halsted came to see her. She began at once: "Dr. Halsted, I have no time to waste, I am a very busy woman, I expect you to operate on me tomorrow." "Yes, Miss A.," said Dr. Halsted, meaning no more than that he had heard her, and turning to me with a sly wink and taking out his watch, "Gracious, Heuer, we are late for that important operation. Goodbye, Miss A.," and he was out of the room before she could say anything further. He did not come to see her again for two days and my attempts to explain his absence may be imagined. On his return she showed her irritation, demanded that he operate upon her, and generally was unpleasant. Again with an excuse Dr. Halsted left the room without giving her the slightest idea of what he intended. He stayed away five days, during which the patient no doubt realized that she was pursuing the wrong tactics. On his return she was properly humble and

requested that he take care of her as soon as he could find time to do so. "Now, Miss A.," said Dr. Halsted, "you are in a proper frame of mind to discuss your problem." And he sat down with her, explained the procedure he had in mind, and operated upon her the next day. On her subsequent admissions she gave evidence that she had learned her lesson as far as Dr. Halsted was concerned, but the rest of us were in no better case.

His hold upon his private patients and his calm assurance that they would cooperate with him even to the extent of becoming the subjects of his experiments were not the least remarkable features of his relationship with them. Because of his interest in hyperthyroidism, tumors of the breast and so on, the majority of patients were women. They were afraid of him and yet they adored him. He appreciated that highly intellectual, cooperative patients are the best subjects for the study of disease, its treatment and the late results of treatment; and he utilized them fully in his investigations. Moreover, he realized that for certain experiments the human subject is a better experimental animal than, for example, the dog; and while extremely careful not to harm, he did not hesitate to experiment upon them. I may cite two instances to illustrate this attitude.

During the period of which I write Professor Kocher of Berne, Switzerland, had described an increase in the lymphocytic elements of the blood in exophthalmic goiter. Dr. Halsted wished to verify these observations on his own patients and, further, to study the effects upon the lymphocytes of partial removal of the thyroid gland. The problem involved not only a study of the blood counts as they appeared at the time the history was taken before operation, but an examination of the blood at the time he began this study. The patients were scattered all over the country; and Dr. Halsted either had to have blood counts made by physicians or technicians in the cities in which they lived or have the patients return to the Johns Hopkins Hospital. To avoid errors which might occur as the result of differences in technique he decided to have them return to the hospital so that a better comparison of their blood before and after operation might be made. He wrote letters to his patients to return, and the results were to me most astonishing. They came from long distances for a procedure which required but a few moments. One woman came from a remote place in Texas and spent four days on the train coming to Baltimore. Dr. Halsted saw her, thanked her for coming, remained while a drop or two of blood was removed from a prick in her finger, wished her a pleasant journey home and left her. Eight days on the train and the expense of coming and going for a five minutes' visit! I made some remark about it. Dr. Halsted's reply, "How better could she spend her time than in contributing to the problem of this disease?" was characteristic of his attitude.

At another time Dr. Carrel had just published his work on wound healing, a subject in which Dr. Halsted was always intensely interested. Carrel had

found in dogs that if a wound were produced by removing a measured area of skin, the wound under ideal conditions and in the absence of infection healed at a definite rate of speed which could be plotted in the form of a graph or curve. He found that this rate of healing was fixed and definite; the curve of healing having been established, the time of complete healing could be accurately predicted by a mathematical formula developed by his coworker, du Noüy. Dr. Halsted realized, as did Carrel, that the dog was not the ideal animal for this experiment; for it is well known how difficult it is to keep a superficial wound in a dog antiseptic, to keep it properly bandaged, and so on. Dr. Halsted wished to verify the experiments and decided that the ideal experimental animal was not the dog and not the ward patient, but the private patient. Having so decided, he assumed, and so far as I can recall always successfully, that the patient would cooperate. Explaining to the patient the importance of the problem and the difficulties in studying it successfully in animals, he told her that during the operation for which she entered the hospital he would remove from her abdomen "precisely one square inch of skin;" and then added, "and then, together, we will study the healing of the wound." It is to be assumed that his selection of patients was carefully made and consisted of those with rather simple conditions which of themselves could not influence wound healing, who were in excellent health and not too fat. The studies of the wound made by the removal of "precisely one square inch of skin" were made by means of instruments of precision, by accurate tracings, by serial photographs and so on. The most rigid aseptic technic was observed, and periodic bacteriological cultures from the wound were made to determine its aseptic condition. Dr. Halsted's interest and enthusiasm in the experiment and in the progress of the wound aroused a similar interest in the patient and she awaited eagerly his daily visit. One woman told me she had never had such an exciting and interesting experience. Forgotten, for the time at least, were the facts that the wound of the operation for which she had come had long since healed and that she was paying private patients' hospital charges over a considerable period of time for the privilege of participating in Dr. Halsted's investigations. I am a little hazy as to the number of such experiments Dr. Halsted performed; several certainly, but that he should have performed them at all is an indication of his intense preoccupation with scientific medicine.

His contacts with members of the hospital staff as brought about by consultation on the wards, for example between medical and surgical departments and arranged by the resident of the respective departments, were sometimes amusing. Usually the opinion of the resident sufficed; in special cases, however, Dr. Halsted's opinion was asked by Barker, Thayer or other members of the senior medical staff. There was some evidence that these men also were a little fearful and uncertain as to what might happen. Every possible examination of the patient was made before the Professor came; every possibility in the

way of a diagnosis was set down in the patient's history so that he might not catch them up. I recall an amusing incident which illustrates this. Dr. Halsted had come to see a patient in the medical wards. The history was a perfect example of the art of history taking, and the examinations were comprehensive and complete. At the end was a list of eighteen to twenty possible diagnoses. While Dr. Halsted was examining the patient's abdomen, the physician who had called him in consultation leaned over to me, who had the history, and whispered, "Put down so and so and so and so," two additional diagnoses which suddenly he had thought of. After finishing his examination Dr. Halsted said, "What do you think, Dr. X?" and Dr. X said he was not sure of the diagnosis but had put down the possibilities he had thought of. "Let me see," said Dr. Halsted and read the long list of diagnoses I have mentioned. Looking up at his colleague, the Professor said, "Of course, Dr. X., we can exclude all but four of these diagnoses and possibly all but two," and made an unequivocal diagnosis. To those who heard him it was just another sly thrust in which he frequently indulged; but to him and to a few who knew him well it had a point, for the practice of listing many diagnoses and assuming that the diagnosis had been made correctly if one of the many proved correct led, in his opinion, to a type of loose thinking to which he was opposed.

His playful attitude in consultation with men he knew well is illustrated by an incident that occurred when I was not present but which is vouched for by those who were. A very ugly woman appeared with an abdominal complaint. Many surgeons saw her but none was able to make a positive diagnosis. Dr. Halsted was finally called and he too was not certain of the cause of her pain or the nature of the mass in her abdomen. Dr. Finney was the last to see her; and after hearing her story (she had not told the whole of it before) and examining her abdomen, announced in the consultation room to which the half dozen surgeons had repaired that, in his opinion, the woman was suffering from an extra-uterine pregnancy. Dr. Halsted's quick, "Oh, Finney, how could that be, she is so absolutely unattractive," was highly appreciated by those present, but did not alter Dr. Finney's diagnosis. She was operated upon at once and his diagnosis was proved correct. Dr. Halsted congratulated Dr. Finney and said: "You know, Finney, I never appreciated before how important it is to be a man of the world."

X. METHODS OF WORK AT HOME AND IN THE LABORATORY

Astonishment has often been expressed that Dr. Halsted achieved so much of fundamental importance in surgery. It is to be admitted at once that the prime factors in his achievements were his ability to see problems of disease as they were presented by patients, his inventiveness in methods of attacking

these problems, his patience and his persistence in following them, his careful study of his results, and his honesty in appraising them. To these must be added what seemed to me to be a determination not to permit himself to become so immersed in matters of less importance as to cause interference with his scientific work. His office suite in the hospital was on the operating room floor and consisted of an office, a small adjoining room which could be used for the examination of patients, and a dressing room. His office contained a goodly number of reference books on surgery and these he used at times to verify some point in anatomy or to look up some subject immediately before his clinic. He occasionally saw patients or visiting surgeons there, but his office was a place to deposit his hat and coat or one in which he changed his clothes for an operation. An office in a hospital as it is today, to which the surgeon-in-chief comes early in the morning and remains until evening—his work shop, but also the place from which he directs his organization, in which he sees patients, consults with a large number of his associates and members of his resident staff, with his colleagues in other departments, the directing heads of the nursing school, the superintendent of the hospital, and so forth ad infinitum—was not for him. He was unwilling to consume his days in activities such as these. At his home he had a splendid surgical library, and two and often three secretaries, all intelligent women capable of searching the literature and one at least able to translate foreign languages. It was here he worked, uninterrupted by the many calls that would have been made upon him had he been at the hospital. It was an unwritten law that he was not to be called at his home; and we, his residents or associates, waited with our problems and difficulties until he chose to come to the hospital, or we called upon Finney or someone else to help us with them. The same was true in the experimental laboratory. He came only when he had something specific to do there; for the rest he left the direction of the laboratory to Cushing while he remained at Hopkins, or to the assistant resident he appointed yearly after Cushing left to go to Boston. The large part of every day, therefore, was reserved by Dr. Halsted for study and scientific research; and he secured for himself in this way large blocks of uninterrupted time to pursue his investigations. Even so, he complained that he would never find the time during his life to pursue the many problems in which he was interested and which he jotted down in his notebook as they occurred to him.

In his work he was as painstaking as in everything else he did. A paper when finally completed for publication represented an enormous amount of work. Not a statement was made which did not represent a search of the literature until the original article was found and studied, for his honesty compelled him not only to make accurate statements which could be verified but to give credit to others who had contributed to the subject upon which he was writing. Accuracy of statement, however, was not his only concern. He labored over the

form of presentation of his material, over the arrangement of paragraphs and sentences and over words which expressed precisely his meaning. He studied the Century dictionary a great deal; and sometimes failing to find the right word, he coined one to express his meaning. This use of unusual words or newly coined words, although an example of his attempts at accuracy of statement, probably confused rather than clarified his meaning for his readers, especially his foreign readers. Yet no one who reads his publications, and especially his longer papers such as the "The Operative Story of Goiter," "Ligations of the Left Subclavian Artery in its First Portion," and "The Effect of the Ligation of the Common Iliac Artery on the Circulation and Function of the Lower Extremity" can fail to appreciate the amount of reading, the critical thought and the time in preparation which they represent. They should be required reading for young men going into medicine and surgery.

In the experimental laboratory his work was extremely careful. The sterilization of the skin of the dog, the draping of the areas concerned, the careful handling of tissues, the control of hemorrhage, the use of the finest suture material of silk, the avoidance of injury to tissues and organs, the approximation of tissues without tension—all were carried out as rigidly as in the operating rooms of the hospital. The desire to make every experiment count, to have no failures due to faulty technic or performance, was evident in everything he did. The development of his "epithelial stitch or suture" in the dog in order to secure better approximation of the skin for wound healing is an example of the lengths to which he went to perfect his technical methods in his experiments. In his experimental work he showed the same inventiveness, the same optimism, persistence and absolute honesty which he displayed in his clinical work. He never made the mistake of visualizing beforehand the outcome of his experiments and of making them fit his preconceptions. He no doubt like most men formed opinions as to the manner in which his problems would resolve themselves; but if they did not fulfill his expectations he was likely to be more interested than if they did and might start all over again with the purpose of determining whether a new approach would bring about the same result.

It has been said of Dr. Halsted that he lacked imagination, which may be defined as the creative faculty; that he was a plodder who returned to a problem over and over again in an attempt to solve it. I do not propose to debate the matter, but rather to point out that the problems he selected and worked on with such perseverance were not only of great importance in themselves but often had wide application elsewhere in surgery. Before his work on hernia, attempts to cure it had almost always resulted in failure, and it even had been stated by an eminent American surgeon that it could not be cured by surgery. His prolonged studies of the condition resulted in an operation or operations which cure from 93 to 98 per cent of the patients; and the principles underlying the operation have been successfully applied to all hernias wherever they

occur and whatever their cause. The development of his operation for cancer of the breast not only has resulted in a procedure most successful in the treatment of this disease but in an understanding of principles equally sound in dealing with cancer elsewhere in the body. His clinical and experimental work on the thyroid and parathyroid glands has resulted in an operation for diseases of the thyroid gland which has almost universally been adopted as the safest and soundest. His work on the surgery of the blood vessels carried on both clinically and experimentally for years led finally through himself and his associates (Reid, Holman and others) to an understanding of the physiology, mechanics and balance of the circulation undreamed of before he became interested in the subject, and consequently to a degree of safety in operating for diseases of the arteries and veins unknown before. His experimental work in intestinal suture, to which indeed he returned again and again with an interest, patience and perseverance quite remarkable, is another example of his clear perception of the importance of the problem, one which he was never able to solve to his own satisfaction.

His attitude toward his own scientific research was unusual. He was extremely modest concerning his work and did not often refer to it. He was apt to abandon a planned morning's work in the laboratory if younger men were working there, saying that their work was probably much more important than his. Although critical of it, he was always generous in his praise of the good work of others and referred to it often. He must have been aware that he had suggested many of the problems to his staff in general surgery and in the specialties of surgery, the research upon which brought them recognition and distinction; but if he felt badly over their failure to give him credit for the idea they utilized he never referred to it in all the years of my association with him. He seemed, with reference to his own work, to be unconcerned about questions of priority. It does seem unusual that in my association with him for fifteen years, during which time the methods of local anesthesia he developed were constantly used and Schleich and Schleich's method frequently referred to in his presence, he should never have referred to his own work on the subject, much less to the fact that he antedated all others in the development of local anesthesia and was responsible for both nerve blocking and local infiltration as methods of rendering tissues insensible to pain. Cushing, who rediscovered the principle of nerve blocking and who applied it successfully in operations for hernia and published a paper on the subject—all during the time he was an assistant to Halsted—was apparently unaware that his chief had discovered and used the method years before. It was not until April, 1922, that Dr. Halsted's rightful place in the development of this important subject became generally known although he had published a paper on the subject as early as 1884. The American National Dental Association, after a painstaking investigation of a committee headed by Dr. C. Edmund Kells of New Orleans, gave him

full credit as the originator of the method of neuroregional anesthesia. Yet he was, of course, aware of it and did refer to it in private correspondence.

Another illustration of this attitude became evident in 1922 when, in the course of a discussion at the American Surgical Association of a paper by Edward Klopp on refusion or reinfusion of blood in hemorrhage, it was brought out that Dr. Halsted had practiced the procedure thirty years before and had saved a number of lives while acting as surgeon at the old Chambers Street Hospital in New York. Credit had been given Johann Thiess of Leipzig as the originator of the method; but Dr. Halsted had antedated him by some thirty years in using it in the treatment of illuminating-gas poisioning. These are but two examples either of his indifference to claims of priority or to a shy and retiring nature which prevented him from publicly calling attention to his own achievements.

MacCallum in his biography calls attention to Dr. Halsted's change in his methods of work and in his attitude toward scientific investigation as the result of "full-time" medicine, on which basis the surgical staff at the Johns Hopkins Hospital was reorganized in 1913. MacCallum suggests that it made Dr. Halsted feel a new responsibility not only for the active prosecution of his experimental and other studies but more especially for the vigorous encouragement of his assistants to work with him and to become more intimately associated with him in the effort to solve his problems. He suggests that this feeling was the basis of the increase in Dr. Halsted's activity which became intense about this time; that the new plan released him from much routine operating and gave him leisure, and that it resulted in a far greater intimacy with his chosen assistants, who then really became his disciples, and ultimately his fellow-workers. There may be some truth in MacCallum's idea. But Dr. Halsted's lack of interest in private practice, indeed his deliberate avoidance of it, his preoccupation in scientific research, the constant stimulus he exerted on his associates and resident staff, indicate to me that he was in spirit and action as near an approach to the ideal of a "full-time" man as could be imagined, and he had been so long before full-time medicine had been suggested at the Johns Hopkins Hospital and Medical School. The reorganization of the surgical staff consisted, as far as I can recall, in placing Dr. Halsted and me on a salary basis and securing for him an additional secretary who worked at his home; in all other respects the organization was as before. The change did not relieve him of much routine operating, for he never, in the years of my association with him, concerned himself with routine operating. If anything, he operated more frequently. His activities in the wards and operating rooms and his enjoyment in clinical work were certainly in part due to the relationship between him and his resident staff. It is quite true that at the time full-time medicine was established he became more active in the wards, operating rooms and experimental laboratory; but I would point out that his health was fairly good,

that there succeeded me in the residency a group of men, McClure, Dandy, Reid, Holman, Reichert and others, who were devoted to him and had great ability. Moreover, Cushing had gone to Boston and had in a sense released the laboratory so that he could more often work in it. This last fact explains to me better than a change in organization Dr. Halsted's increased activity there. Previously Cushing had pretty well taken over the laboratory. The prosecution of his own problems, his activities in teaching the students the principles of surgery through a course of operative surgery on animals, the number of men he had working on problems which he suggested, all resulted in straining its facilities. There seemed no place for Halsted in the midst of their activities; and his respect and admiration for Cushing, his own modesty with respect to the importance of his problems, and his instinct of a gentleman prevented him from asserting his rights and privileges as head of the department. He spoke to me of the importance of retaining control of the laboratory; and thereafter put in charge of it young men, selected indeed because of their possible instinct for research, but men who conducted the laboratory for him.

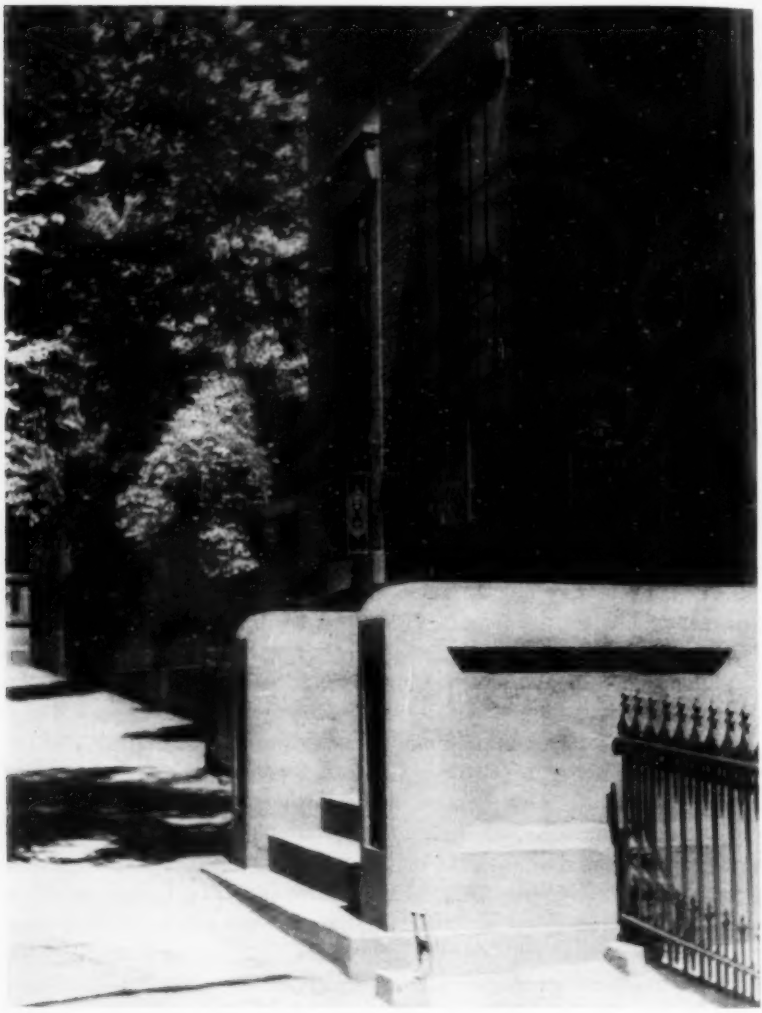
XI. LIFE AT HOME; HABITS

I have wondered if I should write anything of Dr. Halsted in his home. Because of his nature, he himself would shrink from any such exposure of the details of his everyday life. It is not with the intent of displaying for public gaze what might be considered amusing peculiarities that I recount some incidents in his home life; but rather to show that he had a certain make-up which determined his habits; that his meticulousness and his search for perfection in his surgical work was shown also in other aspects of his life.

Following my return from Europe in the fall of 1914, Dr. Halsted invited me to stay with him at his home until I had become reestablished, an invitation which I accepted with pleasure, little knowing at the time the embarrassment I should suffer because of his conceptions of the duties of a host and his overwhelming kindness to me. It must be recalled that I was comparatively young, having just recently completed my residency in surgery, that I stood in great awe of him, that my conception of our proper relationship was to serve him in every possible way. To find this relationship reversed, that he would wait upon me and concern himself with my comfort, I confess had not occurred to me. Mrs. Halsted had not returned from North Carolina and I was installed in her apartment on the third floor of their home.

Briefly, the house on the corner of Eutaw Place and Dolphin Street was a rather large, square red brick structure with three stories and a basement; a common type in Baltimore, with steps leading up from the brick sidewalk to the entrance on the first floor. Rooms on the first floor housed, with the ex-

ception of favorite books in his own room on the second floor, his surgical library, included a dining room and provided space for his secretaries; the second floor



Dr. Halsted's House in Baltimore

was Dr. Halsted's apartment, the third was Mrs. Halsted's. In the arrangement of the rooms of the two apartments, each was a duplicate of the other. Facing Eutaw Place was a large room used by Dr. Halsted as his work shop, by Mrs.

Halsted as a sitting room and library. Behind it were their bedrooms and accessory rooms. I have always regretted that I could not get a picture of Dr. Halsted's room with him in it as he was of an evening. It was to me a lovely room: large, airy, a big fireplace in the middle of its north wall with a bright fire constantly burning which he tended with the attention to detail he showed in everything he did; the south wall lined with book shelves interrupted by a beautiful antique mahogany secretary; his work table towards the center of the room opposite the fireplace with his chair placed so that he faced it; the furniture all, or nearly all, beautiful antique mahogany pieces; the rugs equally beautiful, antique and rare. It was, I should say, the perfect room you would expect the Professor to have, did you know him well.

In these surroundings he did his reading, writing and thinking. I saw him there only in the evening and then only for brief visits after each of us had returned from dinner at the Maryland Club; for he worked every night and often late at night and I hesitated to consume the time I felt sure he was eager to apply to his studies. But these short visits were a revelation to me and gave me an insight into his character which I otherwise could not have obtained. Sitting there in his room with the windows open and his fire burning brightly, his coat and vest replaced by a dressing gown, his shoes by a comfortable pair of old carpet slippers, smoking innumerable cigarettes placed in an inexpensive cigarette holder which he bought by the hundred and discarded as soon as they were stained with nicotine, he was at ease, his shyness and remoteness gone. He became a lovable gentleman, kindly, courteous and tolerant. His conversation did not cover a very wide range of subjects. It concerned, more than anything else, surgery and its problems, and I was more impressed than ever with his intense interest in surgery, his own modesty regarding the contributions he had made, his honesty in his work and his appreciation of the work of others. His comments about men in medicine, the members of his staff at the hospital and his colleagues in this country and abroad, were interesting, revealing and often entertaining; for he exposed equally their good qualities and their faults, the latter by some unusual statement or twist of expression which seemed at the time very amusing. He discussed the men on the resident staff, their particular aptitudes and their possible careers. With respect to myself he suggested that my particular forte lay in the operating room and in the training of young surgeons; and if I have had any particular forte, time, I think, has proved him to be correct. Curiously enough, he repeatedly told me that a career in surgery for a man of my training lay in New York and advised me, should the opportunity offer, to go there and teach the kind of surgery in which I had been trained. Outside of surgery his conversation dealt with the things in which he was interested: antique furniture and rugs, astronomy which he studied as an amateur in the mountains of North Carolina, and dahlia raising of which he was very fond. Occasionally he reminisced about his experiences abroad. Mac-

Callum is correct in saying that he knew well and accurately the things in which he was interested.

During my stay I was repeatedly embarrassed by his kindness and by his constant thought for my comfort. At about ten o'clock on the first evening I was with him I heard his footsteps mounting the stairs to my apartment. He appeared in his dressing gown and slippers with an armful of wood for my fireplace and a carafe of ice water for my bedside table. He had selected the wood in the basement and carried it three flights of stairs to my room, and he was a little short of breath as a result. My surprised protests no doubt showed my embarrassment. To allay it he sat on the corner of the table and assured me that, coming from Wisconsin where the winters were so extremely cold that a furnace alone made life possible, I could know nothing about the selection of wood for a fireplace; and he went on to give me a dissertation on different woods, the size of the logs, the duration of their seasoning, the technic of their proper arrangement for a good fire, the disposition of the ashes at night for the preservation of live coals in the morning, and the desirability of living and working in a room with warmed fresh air secured by open windows and a bright fire. In spite of my assurances that I could learn all these things, he never permitted me to do so; and during my stay he continued to bring wood to my room, did many other kindly and thoughtful acts, and constantly inquired into matters for my comfort. I may say in passing that I have never been permitted to learn about a fireplace; for I married a Southern woman who has been as convinced of my profound ignorance and of my inability to learn as was Dr. Halsted.

Another instance of his concern for me was the matter of food. Dr. Halsted had a gas stove in his large bathroom, and it was his custom to prepare his simple breakfast while getting ready for the day. There was a similar arrangement on the third floor, but I breakfasted in the dining room alone excepting that occasionally Dr. Halsted, having already had his breakfast, came to sit for a few moments with me. On such occasions he scanned the food I ate, changing his glasses as he did in the operating room. Things had to be perfect. Boiled eggs of the sort to which one became accustomed during many years of life in boarding-houses, student clubs and hospital dining rooms, I promptly observed I could not eat. They must be coddled; and if on being opened they did not present the sort of opalescent, quivering jelly which he deemed desirable, he called the servant, in spite of my protests, and had them removed and replaced by others. I discovered that he personally selected the grapefruit and other fruits I had for breakfast in the Lexington Market, which was some distance from his home. This discovery came at a time when I had learned from other experiences that nothing could be done about it; but that he should concern himself with such matters disturbed me.

There was an atmosphere of prodigality about the house. There were quantities of cigarettes which he heaped upon me, many more than I could possibly

smoke. There were boxes of cigarette holders, one of which containing 100 he gave me on my arrival with the statement that I should call on him for more when I had used them. It seemed that everything one could use in one's work or for one's pleasure and comfort while reading and working was about in profusion. There was, however, no liquor, and I never saw Dr. Halsted take a drink nor was I offered one while with him. Most remarkable to me was an incident concerning fountain pens. I had been writing in my room on the third floor and my pen "went dry;" and not finding any ink I went down to his room to fill it. He asked to see my pen, examined it carefully and remarked: "You might like to try another." He then opened a drawer of his secretary and took out three boxes of fountain pens, each containing a dozen, and all filled with ink. He handed me a box and told me to try them out, with the statement that a perfect fountain pen was not easy to find. His servants evidently took advantage of the general atmosphere of the house. There was a house telephone system by means of which one could not only telephone from room to room but from any room to the outside world. Not being familiar with the system, I called the hospital soon after my coming and waited for my connection; and could not help overhearing a servant ordering a ham, a large quantity of pork chops and some other meat, none of which, of course, appeared on the table. In speaking of the servant problem some time later, which in Mrs. Halsted's absence he found rather difficult, he remarked that he was feeding the colored population of the entire neighborhood, but didn't see what he could do about it.

When Dr. Halsted appeared in public he did so with respect to his dress as a well-nigh perfectly appointed man. His black derby hat always looked new and was without fleck of dust, his dark blue suit was well fitting, of fine material and faultessly pressed, his linen was always immaculate, the cravat modest in coloring and expensive, his gloves absolutely unsoiled and his shoes shining with surpassing brilliance. Dr. Finney speaks in his autobiography of the sartorial splendors of the medical staff in an earlier period—of Osler, Barker, Thayer and Sladen and of Dr. Halsted's remark, "Fine dressers, these medical men, aren't they?" after passing one after another of the four in the hospital corridor. One would not have been likely to have made the same remark with respect to Dr. Halsted, for his attire could not, because of his nature, call attention to itself. "Fine" applied to it would refer to its quality, its perfection. There were many stories around the hospital regarding Dr. Halsted's clothes, shirts and shoes. Some of them had some basis in fact. It is true that he took or sent his dress shirts abroad to be laundered because, as he said, he had failed to find a laundry in this country which would launder a dress shirt properly. He had a large wardrobe with many shelves, and on these were arranged neatly in piles a sufficient number of perfectly laundered shirts to last him through the season. When soiled they were put aside to be taken or sent abroad in the late spring or early summer where they were laundered, I think in London. Late in my

association with him, not long before my going to Cincinnati, he told me with great satisfaction that he had at last found a little place in Baltimore where they laundered shirts sufficiently well to make unnecessary his sending them abroad. His shoes were made by a certain bootmaker in Paris; his leather equipment such as travelling bags, his brushes and so on, came from a certain firm in London. I do not know for certain where he got his clothes; but they, his ordinary linen and other items of his apparel were of the finest quality. After his death Mrs. Halsted gave me some of his handkerchiefs; they were of a quality of linen so far beyond that to which I have been accustomed that I have never been able to bring myself to use them.

It was said of Dr. Halsted that when he gave a dinner at his home or at his club he himself attended to all the details: the selection of food, the arrangement of table and flowers, and so on. This I cannot verify from my own experience; but knowing his attention to details in everything else, I do not doubt it, and I am told that his dinners were the perfect affairs one would expect them to be.

This is all I shall say of his home life. My purpose in writing as much as I have is to suggest two things which this intimate association made clear to me: first, that certain habits and actions which were joked about around the hospital as extraordinary peculiarities of a strange man were, after all, quite consistent with his makeup; and second, that he had another side to his nature than the aloof, remote, even repelling exterior he often presented about the hospital and elsewhere. He was good, kindly, thoughtful and sympathetic. He welcomed and appreciated affection; he was human.

XII. LIFE IN THE COUNTRY

MacCallum in his biography of Halsted devotes a brief chapter to High Hampton, the summer home of the Halsteds; and those who have read it will have obtained some idea of the place and the sort of life Dr. Halsted lived there. For those who have not read it and who read this little volume I should like again to refer to it; for outside of the charm of the home and its surroundings my visit there showed me some new facets of his character: his devotion to Mrs. Halsted as well as her devotion to him; his spirit of fun; his pleasure in his dogs; his kindness and consideration of the North Carolina natives who lived around him; his love of flowers, and his interest in astronomy. He invited me to spend a month with him and Mrs. Halsted one summer; and no doubt fearing that I might be bored in the absence of anyone my age he suggested that Dr. Clyde Guthrie, a good friend of mine, come too.

High Hampton lay in Cashiers Valley in the mountainous western tip of North Carolina. We got off the train at Lake Toxaway. It so happened that it

was the morning after the dam impounding the waters of this artificial lake had given way and emptied it. It was a curious, desolate sight—beautiful summer homes surrounding a vast basin of mud in which stood the tree stumps of a forest of earlier times and quantities of fish, some dead, some flopping about in small pools. We travelled from there to High Hampton by team over a long and most difficult mountain road. One was impressed with the inaccessibility of the place which made High Hampton an ideal retreat for those who loved solitude.

It was, at the time, an estate of over two thousand acres. It is difficult to give in writing an adequate idea of the great natural beauties of a place. But I took pictures, some of which are here shown, to give some idea of their home and its surroundings. The approach was a long, winding road flanked by trees, shrubs and flowers which led to the houses set in a wide lawn with splendid large old trees. The house itself was of simple clapboard construction, the pine wood exterior unpainted and nicely weathered. The house had a wide porch around two sides; a small guest house had a "stoop" over its front entrance. The interiors of the two houses also were simple. There were, of course, fireplaces and comfortable furniture; but no effort apparently had been made toward an elaborate or dressy summer home.

From the veranda one could look out over a panorama of fields, woods and streams to Chimney Top or Whiteside Mountains in the distance. There was a beautiful little lake near the houses, well stocked with trout, and a lovely little stream which fed it and carried away its surplus waters. There were other more beautiful streams and water falls which one discovered in one's ramblings. To one who enjoyed days of trout fishing, long walks, mountain climbing and horseback riding it was a spot about as ideal as one could find. But to Mrs. Halsted it was more than a paradise for recreation, sports and loafing. A part of the estate she farmed energetically and raised crops which they did not always know how to dispose of. There was the matter of dahlia cultivation in which Dr. Halsted was so interested, but which Mrs. Halsted attended to in the spring and fall. As there was need of building materials she had built a sawmill. There must have been difficulty in getting proper meal, for she had built a mill and her water-ground meal was famous. Her days were anything but inactive. One saw her start off early in the morning in high heavy boots, a short homespun skirt, a shirtwaist and broad brimmed hat, either afoot or in a buckboard if her activities lay at a distance.

Dr. Halsted's life was quite different. One saw him start off at a later hour, immaculate as usual, but in a loosely fitting tweed suit, a shirt with a soft collar, a soft felt hat, rather heavy walking shoes, a cane and his inevitable cigarette, with his four dachshunds, for a long and usually solitary walk in the woods. A part of the day he spent with his books reading and writing. His dahlia garden was a source of unfailing interest and pleasure, and he usually could be found

there some time during the day walking along the grass pathways between the plants, examining the blooms and sometimes consulting with his gardener. At night when the heavens were clear—and on ideal nights the vault of the heavens seemed so low that one could almost reach it—he spent considerable time studying the stars through a telescope. This was mounted on a platform just back of one corner of the house and was connected by a walk with the veranda.

Guthrie and I were established in the guest house and had an old colored servant with crinkly white hair to look after us. He was one of the "old school," always respectful, always good-natured, always willing and eager to do any-

thing to serve us. We had our breakfast in our own quarters, almost always were off for the day with a lunch, and had our dinner with the Halsteds. The morning after our arrival I found our small living room full of flowers, of which

Scenes from High Hampton

gorgeous dahlias made up the greater part. They were there almost every morning and it was Dr. Halsted himself who provided them. I saw him on several mornings in the chill morning air in his pajamas, bath robe and slippers with an armful of dahlias; these he deposited and arranged quietly in our

living room to greet us when we got up. An amusing incident occurred in connection with these morning activities which showed both Mrs. Halsted's solicitude for his health and his love of teasing her. Dr. Halsted was out one morning when there was particularly heavy dew, the lower half of his pajamas soaked and clinging to his legs. Mrs. Halsted came out on the veranda, clad as usual in her heavy boots and short skirt and saw him there. "William," she called, "how many times have I told you not to go out like that? Look at your slippers, they are soaking wet." Looking shamefacedly down at his feet, Dr. Halsted said, "Yes, Caroline, so they are. I'll take them off," and he stooped down, took off his slippers, carried them in his hand and continued in his bare feet. Mrs. Halsted's muttered comment I could not hear; but her look and the movement of her hands and shoulders expressed her hopelessness of doing anything with him.

In connection with our fishing I may relate an incident which is perhaps a commentary on Dr. Halsted's boyhood. We had only a limited number of trout flies. These became exhausted in time and we could not get others. There are friends of mine who are ardent trout fishermen who would prefer to give up fishing rather than descend to worms for bait. Indeed, my sons would not permit me to do so now. But this time we disregarded the finer instincts of the true fisherman and for a time fished with worms. I had thought that every boy knew the habits of "night walkers" or earthworms, how at night they may be found stretched out at full length on the lawn near their holes and with what astonishing rapidity they disappear down their holes when disturbed. We told Dr. Halsted one evening that we were going to catch night walkers on his lawn when it grew dark and asked him for a flashlight. He was absolutely incredulous and thought we were "spoofing" him. So we invited him on the hunt and demonstrated hundreds of worms stretched out on his lawn and caught enough of them for our next day's fishing. He was perfectly amazed, declaring he had never heard of it and was almost childishly interested. On several nights thereafter we saw him on the lawn by himself studying the habits of the earthworm.

Because of Dr. Halsted's interest in our enjoyment there was never a dull moment for us; and at the end of the day when we were all sitting on the veranda after dinner his interest in our adventures stimulated our accounts of them. On the longer fishing and mountain climbing trips he insisted on providing a guide so that we might not get lost. I could write a chapter about the guide. He was a native who told us he preached in the church on Sunday; but if he did I am convinced he was a thorough rascal the other six days. One of his many occupations, he told us, was catching rattlesnakes which he sold to zoos in various cities; and on his agreement to take us on a rattlesnake hunt and with Dr. Halsted's dubious approval, we spent an entire day clambering about on top of Whiteside Mountain in the brilliant hot sunshine searching

the places where our guide said rattlers were sure to be, and poking under rocks with long forked sticks when we failed to find them basking in the open. The technic, as he demonstrated it, was to pin the snake down with the fork of the stick placed behind its head, pick it up and place it in a stout bag, which indeed he carried. But it was all to no avail. We had a grand time climbing about, saw some new and beautiful views from the mountain top, and were vastly entertained by the astonishing tales of his experiences with rattlers; but we failed to find a snake of any sort. On our fishing trips his intimate knowledge of every likely pool—which he always got to first—suggested that although all fishing waters on the Halsted lands were posted, he frequently fished them without Dr. Halsted's knowledge.

Breakfast was sometimes prolonged, usually because Dr. Halsted was not satisfied with the food we had to eat. Guinea eggs only were permitted us in the country for in Dr. Halsted's opinion they were superior to ordinary eggs. His first question, when our colored servant brought our eggs, was whether they were guinea eggs; and satisfied on this score he examined them when opened to see if they were properly coddled. If not to his satisfaction they were removed and replaced by others. One morning I recall the eggs were changed three times before they satisfied him. This was quite amusing to Guthrie and me. We were at breakfast eager to eat any kind of egg, for our vigorous exercise every day out in the open and a long night's sleep in the cool mountain air gave us the keenest sort of appetite.

Dr. and Mrs. Halsted both enjoyed their dogs. While I was there they had four black dachshunds, extremely playful and active animals which Dr. Halsted took with him on his walks and played with a great deal on the lawn around the house. They were a part of the Halsted family. They had their own entrance to the house—a square hole through the wall on the level with the veranda into which was fitted a small swinging door through which they dashed in and out of the house at will. They had their toys, such as rubber balls and so on, with which they played on the lawn, Dr. Halsted often joining in the game. They slept with the family. They were eager and energetic hunters and, on Dr. Halsted's walks through the woods, they hunted in a pack, noses to the ground and dashing everywhere after real or imaginary game. They were sometimes bitten by snakes; and then Dr. Halsted's solicitude was very real and he worked over them as he would over a human patient. If a dog showed a wound with a swelling of the tissues around it, Dr. Halsted's measures were prompt and, he said, always up to that time effective. He kept on hand a solution of potassium permanganate which he injected with a syringe into the wound and into the tissues around it. The oxidizing effect of potassium permanganate on snake venom is, of course, well known and the substance is incorporated in a first-aid kit which is widely used.

Speaking of the dogs' playthings reminds me of an interesting incident con-

cerning their rubber balls, which occurred one evening when we were all sitting on the veranda after dinner. Dr. Halsted had been playing ball with the dogs and was sitting on the porch leaning against one of the supports, a hard, black rubber ball about the size of a tennis ball in his hands. He began to press it here and there with his short stubby thumb—in fact he was palpating it—and after a time he looked up at Mrs. Halsted and said, "Caroline, this ball is not solid, there is fluid in it." "Nonsense, William," said Mrs. Halsted, "those balls are solid rubber balls; I bought them purposely because they are solid rubber." "You are wrong, Caroline," said Dr. Halsted. "I'm not wrong," said she; "Give it to Dr. Heuer and see what he thinks." I examined the ball as carefully as I could and agreed with Mrs. Halsted; and so did Guthrie. "Since we disagree, I shall have to cut this one in two," said Dr. Halsted; and in spite of Mrs. Halsted's protest he got a knife and cut the ball into two equal halves. In the center of the ball was a cavity less than three quarters of an inch in diameter filled with water, around it a thick layer of hard rubber. I recount this story as an instance of his great ability in the art of palpation and in the interpretation of palpatory findings. He practiced this art constantly and even at his summer home he was feeling everything. He put his knowledge to some practical use. We arrived at High Hamptom at the time the sweet corn was about ripe. I found Dr. Halsted one morning walking along the rows of corn feeling the ears through the husks. I asked him what he was doing and he replied that he was selecting some corn for lunch. He had found, he said, that a particular crunch when he pressed an ear of corn indicated that it was ripe for eating. He tried to teach me the sensation obtained and, after some practice, I thought I recognized what he meant. No one else was permitted to gather corn; and it had to be gathered immediately before a meal. Certainly it was unsurpassed if one enjoys "corn on the cob."

In his relationship with the natives in the surrounding country there was on their part the greatest respect for him, on his part kindness and sympathetic understanding, particularly when they were in trouble and especially when they were ill. Their ignorance, their manner of living, their superstition and so on must have been repugnant to him. But he was, for the most part, tolerant; and if they were sick he seemed always ready to see them, to go to their cabins, if necessary, and to advise them what should be done. He sent a good many of them to the hospital in Baltimore, paying their expenses of transportation and hospital treatment; operating upon them and caring for them afterwards. They consulted him about their sick animals, usually a horse or a cow. When he was not down in the country they wrote letters to him about their problems and there are many letters full of gratitude to him for his care of them. I remember one countryman whom Dr. Halsted had sent to the hospital and had operated upon. He made a splendid recovery and eventually was well enough to go home; but he seemed in no hurry to make

the trip back to the mountains. I had several talks with him about it but he always had some excuse for not going. One day when I had again referred to the matter he asked me if there was not a good job I could get him around the hospital. It was then he admitted that he had never seen a train or ridden in one before he came to Baltimore, and had been so frightened on his journey to Baltimore that he preferred to stay rather than to repeat the journey home. It was only after a good deal of persuasion that we got him started.

It was, perhaps, his dahlias which gave Dr. Halsted the greatest pleasure in the country. I had heard of his dahlia garden long before I saw it. It was justly famous. I know nothing about the subject but have been to dahlia shows; and in size, coloring, variety and beauty his dahlias were equal to or exceeded anything I have seen. They flourished in the mountains. Dr. Halsted knew and was in touch with all well-known dahlia growers in the country and abroad and received from them the new varieties of field-grown bulbs which they developed. These Mrs. Halsted and the gardener planted before he arrived and when he came they were usually in bloom. They were planted in plots between which were paths of grass; and it was Dr. Halsted's custom to walk among them every day, bending down the tall stems to examine and admire the blooms. He seemed never to tire of this. He loved to gather great armfuls of them which, as I have said, he arranged in our guest house and in his own. I tried many times to get him to permit me to photograph him among his dahlias but he never would do so, and knowing his intense aversion to having people try to "snap his picture" I dared not attempt it. His dahlia garden was so large and his acquisition of new bulbs so frequent that he had an excess of bulbs. These he and Mrs. Halsted gave away, among others to the "neighbors" in all the surrounding country; for one saw in driving within a radius almost reaching Toxaway Lake gorgeous dahlias growing in the little front yards of the poorest cabins.

Astronomy, again, is a subject about which I am ignorant and how deeply versed in this science Dr. Halsted was I am not qualified to say. He had books on the subject and these he studied; and he had the large telescope I have mentioned with which he explored the heavens on clear nights. He frequently said he was a bad sleeper, and on nights when he was wakeful he got up and studied the stars. He certainly was perfectly familiar with all the constellations, and he enjoyed walking about the lawn in the evening pointing them out to us and telling us about them. He had maps of the heavens of all sorts; and one ingenious one, which showed the constellations visible in the heavens at any time, he gave me with the hope, I presume, that I might become interested in the subject. I have often wondered what has become of the telescope which the lens grinder in Madison, Wisconsin, assisted in making. Indeed, I have regretted that the idea which was conceived of acquiring the entire estate by those of us who had come under Dr. Halsted's influence was

not energetically pushed to a successful conclusion. High Hampton would have made an ideal place for his followers to go and spend some time together in the summer; a pilgrimage, as it were, for those who owe him so much through actual association but also for those who, although not knowing him, have become so convinced of the correctness of his teaching that they have become his disciples. It is, however, possible to go to High Hampton; for when I last heard, it had become an inn where people may stay for shorter or longer periods of time.

XIII. ADMINISTRATOR, TEACHER AND INVESTIGATOR

All who are members of faculties of medical schools or heads of departments in them and their associated teaching hospitals are, from time to time, concerned with the selection of men to fill the important departmental positions of the institution with which they are connected. In the discussions which take place concerning men who are eligible it is certain that these questions will be asked: Is he eminent in his own subject? Is he an able administrator? an inspiring teacher? a brilliant investigator? It is not assumed that a man must possess all these varied qualities in order to succeed as the head of a department; but it is certain that the more of them he possesses, the more likely he is to build up an outstanding department. Before giving more intimate details of Dr. Halsted in his various activities I may appraise him from the viewpoint of the qualities I have just enumerated. Such an appraisal will show that he possessed those attributes considered most important for a successful career as the head of a department.

Dr. Halsted unquestionably was an able surgeon. He possessed great diagnostic ability, sound surgical judgment, an intimate knowledge of surgical pathology, and a meticulous operative technic. He had a profound knowledge of the factors concerned with wound healing. He studied his cases with great care. It was the custom in the surgical department at the Johns Hopkins Hospital for the interne to take the history and make the physical examination of the patient, for the assistant resident to check the interne's work and make and record a special examination of the condition for which the patient entered the hospital, and for the resident to check the work of the previous two men and add such new data as he could find. All this had two purposes in mind: to assemble all data which might aid in a correct diagnosis for the protection of the patient, and to record all clinical observations for subsequent research purposes. All such data had been assembled before Halsted saw the patient; and frequently we were astonished at the number of clinical observations he made which the rest of us had overlooked. It is to be remembered that at the time many of the laboratory aids to diagnosis we now use

had not been discovered or had not been developed; and therefore men depended more upon their five senses and their past experience in making diagnoses. Halsted's particular forte, I should say, lay in inspection and palpation. It was amazing how much he could discover by carefully looking over the patient, how much he learned by feeling a tumor, or an abdomen or other part of the body. Equally amazing was his ability to interpret the things he saw and felt. I believe it to be true that when he came to operate upon a patient there was little in the way of anatomical relations, of possible pathological conditions, of conceivable difficulties in operative technic or of possible postoperative complications that he had not already visualized. He was a surgical strategist; he went forward but always with an eye to the protection of his flank and rear. Confronted with a situation which made it impossible or unwise to perform the operation he intended, he made a painstakingly safe retreat in order, among other things, that the success of a possible future operation might not be jeopardized.

Each patient Halsted saw and examined was to him a problem for study and reflection. He apparently had no interest in operating upon a hundred cases of this or that disease process, nor did he acquire his knowledge of pathological conditions through a large repetition of experience with them. Rather he was a profound student of disease, a surgical philosopher with an active imagination. Study of and reflection upon a few examples of a disease process gave him a more complete knowledge of it than a large number of examples of the same disease gave to many of his associates. This fact made a profound impression upon me, and in the training of young surgeons I have tried to emphasize the importance of a complete study of a lesser number of cases, rather than the unstudied operative treatment of the largest possible number.

Not only was Halsted a deep student of disease but he was keenly interested in its treatment. He lived in the period which saw the development of aseptic surgical methods, of methods of anesthesia, and of instruments for the control of hemorrhage, all of which made possible the surgical treatment of diseases not only of tissues and organs on the surface of the body but of those within the cavities containing the brain, the heart and lungs and the abdominal organs. He was thus familiar with the development of modern surgical operations for the treatment of disease and himself participated in this development. His own operations for the treatment of hernia, cancer of the breast, goiter, and so forth, were the result of his constant preoccupation in improving methods of surgical treatment. He never lost his interest in this phase of surgery, and throughout his life both in the operating rooms of the hospital and in the experimental laboratory he strove to improve methods which he found faulty. His own illness toward the end of his life is a good example of this interest. He was operated upon for gallstones of the common duct, an operation which at that time consisted in making an incision in the common

duct, removing stones, and draining the duct with a rubber tube introduced through the incision. As a result, the incision in the duct, sutured around the tube, often broke down, allowing the escape of all the bile through the abdominal incision. In some patients this total loss of bile was accompanied by an abhorrence for food and other digestive disturbances so profound that they became emaciated and sometimes died. All this happened to Dr. Halsted. Lying in bed, utterly unable to eat, emaciating rapidly and desperately ill, he nevertheless was able to concentrate upon the problem, and while in bed devised a method of opening and draining the common duct without the loss of bile. This method he explained to us; it was later described in the literature by Mont Reid, and it is the one I have since used and taught my students.

In the operating room Dr. Halsted was not a brilliant surgeon in the older sense of operating with dramatic rapidity, verve and nonchalance. Such brilliancy was the ambition of many of his contemporaries. I recall my visits as a young man to other clinics. In some the surgeon, with his knife poised, in an atmosphere of hushed expectancy, looked at the large clock in the operating room, made the incision, and working at top speed completed the operation. Looking again at the clock he announced to his admiring audience, "A minute and a half," or "five minutes," or whatever time he consumed in performing the operation. It was the practice then, and I am sure still is, that when a young surgeon wanted to know what was going on in a surgical clinic, he did not consult the chief but sought out and talked to young men of his age who were assistants in the clinic; and from them I learned that they spent many nights opening wounds because of hemorrhage due to faulty surgery during the morning's brilliant performance, and many days caring for infected or disrupted wounds. The young assistants failed to see the virtue of such "brilliant surgery."

While a practicing surgeon in New York, before coming to Baltimore, Halsted is said to have been a rapid, skilful operator. During his Baltimore period he was the exemplification of the slow, careful, painstaking surgeon who is concerned with the patient's safety, not with his own brilliancy. He was aware then, as most of us now are, that safe and successful surgery is the result, not of a rapid and dexterously performed operation, but of a combination of factors which includes the routine preliminary preparation of the patient, selected and well administered anesthesia, perfect aseptic surgical technic, the gentle handling of all tissues exposed, the careful avoidance of injury to all structures not involved in the operative procedure, and the use of fine delicate instruments and suture material of fine silk in the control of hemorrhage and the closure of the wound. No one appreciated more keenly than he that the safety of the patient and the success of an operation can be jeopardized by a faulty anesthetic, by infection, by injury to an important structure or by failure of proper wound healing. As a result Halsted insisted upon the

most careful attention to all details of an operative procedure and operated slowly, carefully, and with the single purpose of doing a perfect job with the greatest safety to the patient. An operation for breast cancer, as performed

Dr. Halsted and Mont Reid

by him, might require three hours; and I have assisted him in operations for difficult aneurysmal tumors of the blood vessels which required four or even five hours to perform. Visiting surgeons, observing the prolonged and meticu-

lous preparation of the skin in a breast operation, the exact draping of the operative field, the slow, careful operation, particularly the dissection of the axilla and the trouble taken to close the wound without tension, frequently expressed their astonishment to me, and not a few openly voiced the conviction that the whole business was unnecessary. Moreover, how, with such attention to detail, could they perform ten major operations in a short morning? Although Halsted operated slowly, he did not dawdle; and it was unfortunate that some of his associates outdid him in the length of time they spent on a given case. I recall a visit of Charles Mayo to the operating rooms when an associate of Dr. Halsted's was performing an abdominal operation under local anesthesia. The operation required four hours and I, as the assistant, was as exasperated with the dawdling of the surgeon as Dr. Mayo. At the completion of the operation Dr. Mayo, on leaving the operating room, hooked his arm into mine and said, "What's your name?" "Well, Heuer," he said, "I have had a new experience. I have seen the upper half of an incision healed before the lower half was closed." With a squeeze of my arm he was gone. It has seemed to those trained in Halsted's methods that the surgical profession was slow to recognize their soundness; yet in my professional lifetime they have spread to, and been adopted by, almost all of the important surgical clinics of the country.

As an administrator of a department Dr. Halsted was probably not considered a success by the officials of the medical school and hospital. He apparently disliked intensely spending his time in routine administrative affairs, in committee meetings and faculty meetings, and in the many other activities about an institution which consume a man's time. If he had any ability as an administrator he refused, as far as he could, to exercise it. The details of running the surgical department were left to his resident surgeon, who organized and directed the work of the resident and interne staffs, arranged the teaching schedules and ward work for the students, arranged each day's operative lists, and attended to all other matters concerned with the routine conduct of the department. Having put such men as Finney in charge of the outpatient department, Cushing in neurosurgery, Young in Urology, Bloodgood in surgical pathology, Crowe in otolaryngology, Baer in orthopedic surgery and Baetjer in roentgenology, he largely let them alone to administer and develop their special fields in their own way. His idea of administering his own department seemed to be to select exceptional men for positions of responsibility, have them carry the burden of administrative duties, and conserve his own time for study and research. In his position as a member of the faculty of the medical school and as Surgeon-in-Chief of the Johns Hopkins Hospital he escaped every meeting that he possibly could, and was apparently extraordinarily successful about it. I have heard other members of the faculty chide him for not attending particularly important meetings. He was always

profusely apologetic, agreed he had been derelict in his duty and promised to come to the next meeting; but when the next meeting came around, he failed to appear. No one, nor the institution as a whole, seemed able to do anything about it. He pursued his own way, no doubt convinced that he could make a greater contribution to the institution in other directions; convinced, also, that the institution would not go far wrong without his more active participation in its councils as long as Welch was its guiding spirit.

This ability of the Professor to escape administrative burdens which consume the time, sap the energy and strength, and tend to destroy the productivity of heads of departments was more than once in later years the subject of discussion between Harvey Cushing, after he had assumed the Professorship at Harvard, and me, who held a similar position at the University of Cincinnati and subsequently at Cornell. Both of us agreed that the burden of administrative duties was detrimental to our best work; both agreed that we had tried to escape them as had Dr. Halsted; but each admitted his failure to do so. Cushing's question "How did he do it?" is one to which I have not yet found the answer. Interesting in this connection is the remark of a distinguished German surgeon, at the time a professor of surgery in one of the important German universities. He arrived in New York in the fall of 1932 with the purpose of visiting the important university medical schools in this country. He spent a day with me and we went fully into details of our organization at Cornell and the New York Hospital. Since he was to sail later from New York, I told him I should like to hear his impressions on his return. Some two or three months later he came back enthusiastic over our institutions and the surgical work he had seen in them. But he made one remark which I fear contains a large measure of truth: "You have one great fault in this country. You select your most brilliant young men as heads of your departments and then you destroy them with routine."

The lack of more positive direction of the department by Dr. Halsted had some obvious disadvantages. Members of the staff placed in responsible positions were at times uncertain where their authority and responsibility ended, and knowing Dr. Halsted's preoccupation with his own work, hesitated to consult him regarding their problems. Nevertheless, the rather loose organization functioned well and Halsted's clinic was the most inspiring and productive in the country. I am sure his policy was deliberate; that having selected men, he purposely failed to define their position and work and left them alone so that he could watch their development. It was to the selection of men that he gave the greatest thought. He considered men long and carefully before appointing them to positions on the resident and senior staffs. When in doubt of a man's ability he was at times, willing to appoint him and watch his work for a year. I recall his asking my opinion regarding a young man who had applied for a position on the resident staff. From all sources I found

that the young fellow was difficult to get along with, had not fallen in with the rules and regulations of the school, failed to attend classes in which he was not interested, and generally was unpopular with his fellow students and faculty. No one whom I consulted recommended him. I passed these reports on to Dr. Halsted and being asked my opinion, suggested that he be not appointed. Dr. Halsted replied, "You know, the characteristics you describe have in some cases been those of a genius. I think I shall appoint him." A year later he called me on the phone and said: "Heuer, you were right. The man is not a genius. Good night." He was not reappointed for the following year.

As a teacher of surgery Dr. Halsted was preeminent and with the appointment of his pupils to professorships of surgery in other medical schools his teaching methods gradually have spread to many of the first class medical colleges of the country. This educational movement continues and will continue; for the pupils of Halsted now occupy professional posts and carry on the Halsted tradition. No one, I think, in American surgery approaches him in the number of distinguished surgeons he has produced or in the sum total of important contributions which he and his pupils have made to surgery.

Precisely how Dr. Halsted exerted his influence as a teacher is, in some respects, not clear. As an undergraduate medical student in my travels to and from home I had the opportunity of comparing the undergraduate teaching of Dr. Halsted with that of some of his contemporaries, particularly John Chalmers DaCosta in Philadelphia and John B. Murphy, Arthur Dean Bevan and A. J. Ochsner in Chicago. John DaCosta was a brilliant clinical teacher. His enthusiasm for his subject, his clear exposition of the pathology and symptomatology of surgical diseases, his keen diagnosis, his wide knowledge of surgical treatment, and his ability to hold his students enthralled, all combined to make him, in my youthful opinion, the greatest clinical teacher of surgery of his time in this country. Later contact with all the surgical teachers of that day failed to change this opinion. John B. Murphy was an arresting figure who drew large crowds to his teaching clinics. Dramatic, forceful, with a gift of language, he never failed to impress his students. Surgical diseases as I heard him present them were accompanied by a definite train of symptoms which appeared, with respect to time, in a certain order. If they did not do so, that was not the disease he was discussing. In actual experience nothing is farther from the truth; for disease conditions have a way of not conforming to their usual symptomatology. It is probable that Murphy's teaching methods were deliberate; that his intention was to present to his students concrete pictures of disease conditions which they would remember, leaving them to discover variations from the usual pattern in their own practice later.

In comparison with the teaching clinics of other schools Halsted's Friday

clinics were greatly different. His discussions were profound and usually over the heads of the students. Indeed they were beyond many experienced surgeons who, from time to time, attended his clinics. Often one of them came to me later and said, "Will you tell me what the Professor was driving at?" They, like so many surgeons, were successful "practical" men who gave little thought to the unsolved problems of surgery.

It may be imagined that teaching such as this was not universally popular with the undergraduate students. In other departments they attended classes at which a disease as illustrated by a patient was clearly set forth as to its historical aspects, pathology, symptomatology, diagnosis and treatment; and all they had to do was to sit and listen, only rarely being called upon to think. In Halsted's clinic it was necessary to think and think deeply if one was to follow his discussions. On a number of occasions a delegation of students came to me and requested that I present to the Professor their wish that he take up and discuss in an ordinary way the common surgical diseases. I always refused to do so, telling them I could not change his way of teaching. Once, however, I approached him on the subject. His only comment was, "You must know by now, Heuer, that I never teach the students what they want to hear. How could they possibly know what they should be taught?" As a result he was criticized as a poor teacher; yet I believe the impression he left upon students of his wide reading, profound learning, and scientific curiosity and achievement exerted a greater influence in their later development than the teaching of many of his associates.

Dr. Halsted did not give any formal instruction to his graduate students. By his own attention to the details of his technical methods he stimulated his men to equal and, if possible, to surpass him in operative technic; by his ward visits he set an example which his men strove to emulate in careful observation of the clinical symptoms and signs of disease; by his clinics he encouraged reading and thinking; and by his own research work showed the importance of and the satisfaction in the pursuit of investigative work. He was delighted if a man came to him with a problem which he wished to study. I recall the first paper I wrote as a member of the resident staff. I had rewritten it several times before handing it to Dr. Halsted. He kept it so long that I thought he had lost it or considered it worthless. It finally came back to me with scarcely a line intact. There were questions of the wrong use of words, of awkward sentences or of the arrangement of paragraphs. There were notes suggesting the elaboration of certain statements, other notes suggesting side lines of investigation. It appeared I had to begin all over, spend some six months of further work, and then rewrite the paper. When I next saw him he did not refer to it; but in about a week came a large package which proved to be a Webster's Unabridged Dictionary with his small neat card; a short time later a book by Foster, a distinguished physician in England, "On the

Composition of Scientific Papers;" still later a book by Quiller-Couch on "The Art of Writing English," and so on. It was Dr. Halsted's way of encouraging a beginner in scientific work and its proper presentation.

While his actual instruction as such was minimal, the opportunities he offered his men for individual work and selfdevelopment were extraordinary. No less extraordinary were the responsibilities he heaped upon them. In no clinic in the country were there equal opportunities for young men to develop into surgeons; in none was a young man given such responsibilities in the care of the sick. The combination of inspiring leadership, opportunities and responsibilities led in a selected group of intelligent young men to astounding results, for if you will examine the professional posts in the Class A medical schools of the country for the past twenty-five years you will find a large number occupied by men whom Dr. Halsted trained.

XIV. DR. HALSTED'S CONTRIBUTIONS TO SURGERY

It is, perhaps, difficult for students today to appreciate the magnitude and importance of Dr. Halsted's contributions to surgery. Without a background for comparison it is natural to take for granted the present high development of surgery. While surgery had made significant advances in Europe and America in the early days of Dr. Halsted's surgical activities, it was in its infancy as compared with what it is today. The fundamental principles of surgery having to do with the prevention of infection, with the control of hemorrhage, with the handling of tissues, with drainage and with wound healing were just beginning to be appreciated in a scheme of surgical procedure. Local and regional anesthesia were unknown. The cranial and thoracic cavities had been approached only in accidental injuries, and brain surgery and thoracic surgery as we know them today had not been developed. Surgery of the thyroid was just beginning; there was no successful operation for cancer of the breast, no successful treatment of hernia. A gastric resection had not yet been done; intestinal resection with suture could scarcely be contemplated. In this country surgery of the gallbladder and biliary tract was almost never considered. And so I might go on citing the limitations of surgery at the time Dr. Halsted, as a young man, entered the field.

The surgical approach to disease has two important branches. One has to do with what I have termed the fundamental principles of surgery, those concepts and technics which must be understood and practiced if any surgical operation, no matter where performed upon the body, is to be successful. The other has no do with specific surgical diseases. As a young surgeon Dr. Halsted appreciated that surgery could not greatly advance until the fundamental principles of surgery were clarified, for his first important work lay in this particular field.

Antiseptic surgery was based upon the conception that the surrounding air was contaminated with bacteria causing infection and that these came in contact with the surgical wound, the instruments, the dressings, the surgeons and nurses. If these bacteria could be killed by antiseptic solutions, infections would be reduced or eliminated. This concept was followed within a few years by aseptic surgery, which postulated that it was not the air which gave rise to infections, but rather that infections were caused by pathogenic bacteria introduced into the wound from the skin of the patient, from the hands and clothes of the surgeon and his assistants, and from instruments, dressings and sutures. This assumption led to the more careful cleansing of the skin of the patient in the operative field, to the scrubbing of hands of surgeons and assistants and their immersion in antiseptic solutions, to the boiling of instruments and certain suture materials, and to the autoclaving of dressings, towels and sheets.

These advances in the ritual of operative technic were in the single direction of preventing infection—only one of the fundamental principles of surgery to which I have referred. Dr. Halsted, in his experimental work, showed that neither the antiseptic nor the aseptic methods alone would insure the prevention of infection; that while instruments, dressings, suture materials could be sterilized by boiling or by autoclaving neither the skin of the patient nor the hands of the surgeon and assistants could be sterilized by washing and antiseptic solutions. To protect the patients from the hands of the surgeon and assistants he devised the rubber glove, which can be completely sterilized and which is now universally used. To protect the patient from his own skin organisms he experimented with elaborate technics but found that none of them wholly answered. Faced, as he thought, inevitably with the introduction of some bacteria into a wound, he turned his attention to other factors which might aid in preventing infection. His experiments showed that normal uninjured tissues have a very definite natural resistance to infection, but when tissues are crushed, have their blood supply impaired, or are otherwise traumatized, they lose their resistance to infection. The problem then was to conduct an operation with the minimum of injury to the tissues in the operative field. He devised a clamp with a sharp point known as the Halsted artery forceps, the purpose of which was to stop bleeding without crushing more than a minimum of tissue; he used the finest silk to tie the bleeding vessels, for silk can be completely sterilized by boiling and causes less inflammatory reaction in the tissues than catgut; he was wont to transfix the bleeding point so that the ligature might be drawn just tight enough to stop bleeding without unnecessarily strangulating tissue and yet without the danger of the ligature slipping off; he stopped all bleeding in a wound so that no blood could collect in tissue spaces; he did not pull, tear or otherwise roughly treat the tissues; he closed a wound by approximation of the tissues layer by layer with the finest silk su-

tures applied without tension in order not to impede their blood supply and thus retard healing, and he devised a subcutaneous suture which approximates skin without involving the outer layers which harbor pathogenic organisms. Since he appreciated so clearly the sources of wound infection he was opposed to drainage of clean wounds, not only because drainage was a confession of careless surgery but because infection may be introduced along the drain. But if drainage was necessary, or if a wound required packing, or if an open wound needed frequent dressing he recognized that injury to delicate granulation tissue, the essential tissue in healing by secondary intention, should be avoided, and for this purpose devised a filmlike guttapercha tissue which does not adhere to wound surfaces.

It should be noted that these refinements in surgical technic were not haphazard in origin but were based upon a scientific approach to the problem by the experimental method. They had a profound effect upon surgery. Aside from their undoubted value in reducing the incidence of infection in clean wounds to the present-day minimum, their adoption played an important role in making surgery a much safer form of medical practice. The careful control of hemorrhage, the gentle handling of tissues, the use of fine suture material, the avoidance of tension on tissues, made it possible to spend the time necessary to do careful surgery without shock and without wound complications. The technics implied in the term "Halsted school of surgery" have spread to and been adopted by clinic after clinic, until today they are recognized as the best and safest technics in surgery. To them must be attributed in no little measure the striking reduction in mortality following present-day operations and the vastly improved results over previous techniques.

It was in the field of anesthesia that Dr. Halsted made one of his greatest contributions to surgery, if not his greatest. The story of his discovery and the tragic consequences of his experiments with cocaine have already been described. But to visualize the magnitude of this contribution one must think of the millions of people who have been completely relieved of pain during the performance of dental procedures of all sorts and of the other millions who similarly have been rendered free from pain during surgical operations upon every part of the human body.

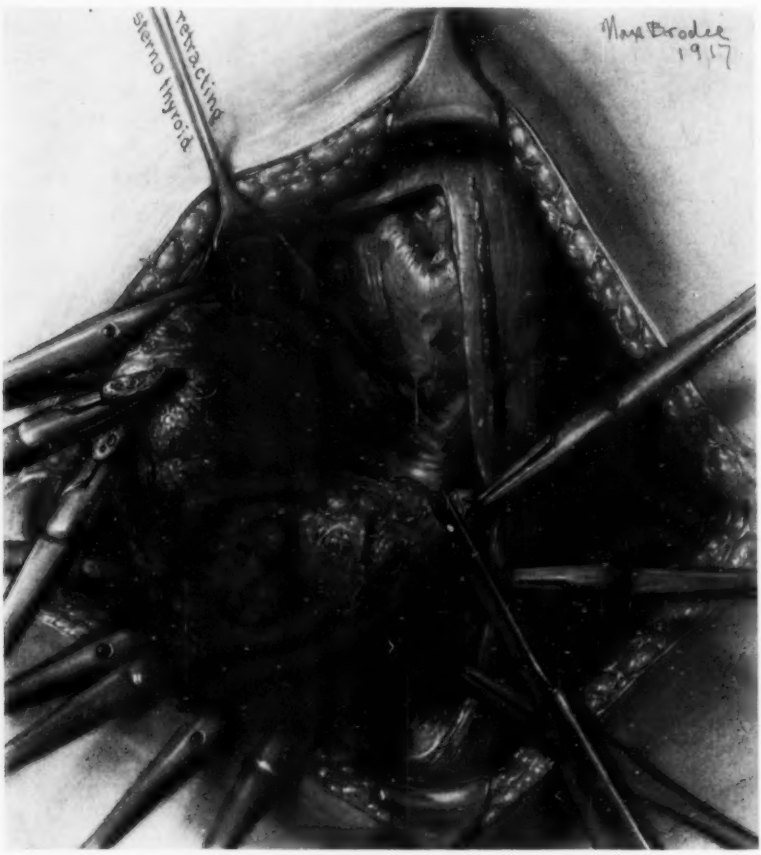
Intestinal suture was among the earliest problems which Dr. Halsted studied in the experimental laboratory. His work showed that of the various layers of the wall of the intestine—mucosa, submucosa, muscle coat and peritoneal covering—it was the thin but tough submucous layer which was strong enough to hold the sutures in sewing together the two ends of the divided intestine or in establishing artificial openings between two parts of the gastro-intestinal system. Dr. Halsted, therefore, postulated that the surgeon who would perform safe intestinal anastomoses must so place his sutures as to pick up and engage within them a bit of the submucous coat. He also emphasized that in placing

them, the needle carrying them should not penetrate the mucous lining of the intestine, for the intestinal canal harbors many bacteria capable of causing serious infections. He devised for intestinal anastomosis a special suture, called the Halsted mattress suture, which brings together the opposing peritoneal surfaces of the intestine so as to establish ideal conditions for healing. This was an important contribution to the problem of gastric and intestinal anastomoses.

The problems connected with the surgery of the thyroid gland also engaged his early interest, which was maintained throughout many years. Undertaken primarily, so he said, to determine the cause or causes of death after operations upon the thyroid gland, his clinical and experimental observations led to a better understanding of the surgical problems related to this important structure. At the time there were two chief forms of thyroid disease: the large so-called colloid goiter, which often caused great disfigurement and distressing symptoms due to compression upon the trachea, and to insufficiency of thyroid secretion; and the exophthalmic goiter, which was associated with symptoms of overactivity of the thyroid secretion and was frequently accompanied by protrusion of the eyes. Both conditions not infrequently caused death or at the least a miserable existence, and they were a constant challenge particularly to surgeons. But the blood vessels in these conditions were so enlarged and numerous that fatal hemorrhage was a real complication; so much so that eminent surgeons of the day declared that operations on the thyroid were not justified. Moreover, patients who survived the operation might gradually develop mental dullness, falling out of the hair and other symptoms of deprivation of thyroid secretion; or they might develop extreme nervousness, sweating, muscular tremors and even epileptiform convulsions due to injury or destruction of the parathyroid glands. These tiny glands lying along or embedded in the lateral borders of the thyroid lobes had previously been known anatomically, but physiologically their importance in the maintenance of life of the individual had not been recognized until the important discoveries of Gley in 1891. These various considerations led Dr. Halsted to remove and transplant the thyroid gland of dogs, which resulted in the discovery of the striking histologic changes which signify hyperplasia and hyperactivity of the gland and which are identical with those found in hyperthyroidism and exophthalmic goiter. This discovery led also to the transplantation of the parathyroid glands with the idea of curing the symptoms of tetany incident to deprivation of parathyroid secretion, should they occur after removal of the thyroid lobes. These experiments led him to the formulation of a general law that homografts will not live and that for the successful transplantation of autografts a considerable deficiency must be created. He announced that the life of a dog may be maintained by a particle of parathyroid tissue only one quarter of a millimeter in diameter and may be extinguished by tetany on its removal. Finally, his studies led him among other things to devise and describe, with admirable illustrations by

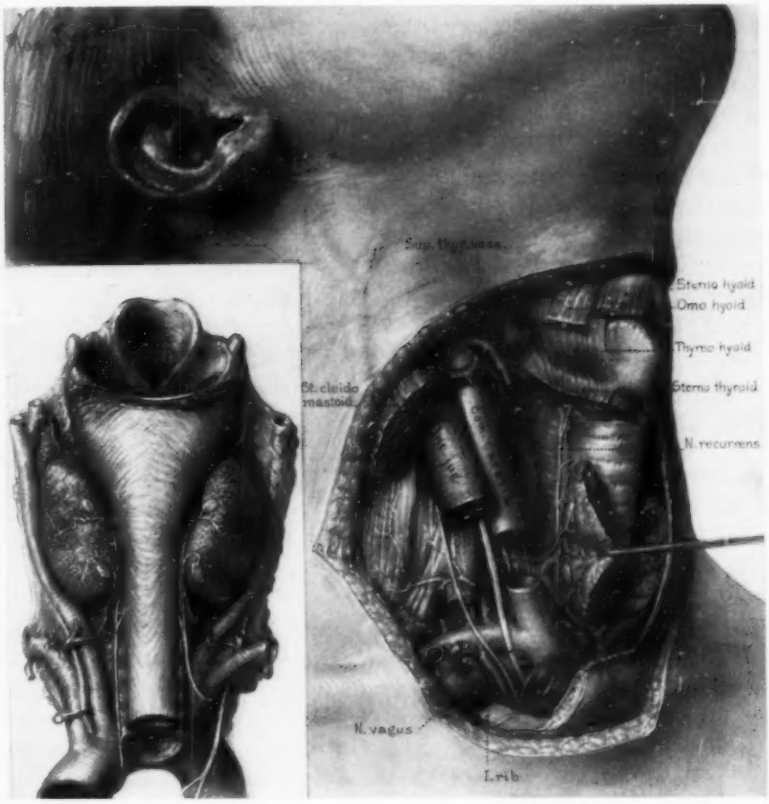
Brödel, an operation upon the thyroid gland, safe not only from the viewpoint of avoiding hemorrhage but of protecting the patient against removal of or injury to the parathyroid glands.

The story of the development of the surgical treatment of cancer of the breast is a long and interesting one, of which only the important features can be given



here. Known as a specific disease throughout recorded history, cancer of the breast was discussed by physicians of the Egyptian, Greek and Roman periods, and by those of the so-called Dark and Middle Ages. Although a certain knowledge of the disease had been acquired and surgical operations had been performed for its treatment, it was not until Jean Louis Petit, a French surgeon

who lived between the years 1674 and 1750, that a new era in mammary surgery may be said to have been inaugurated. Petit believed that the enlarged lymphatic glands in the axilla represented the roots of cancer of the breast; and that they, together with the breast tumor and when necessary the pectoral fascia and muscle, should be removed. It is true that in the removal of the axillary glands Petit was antedated at least a hundred years by Hildanus; but

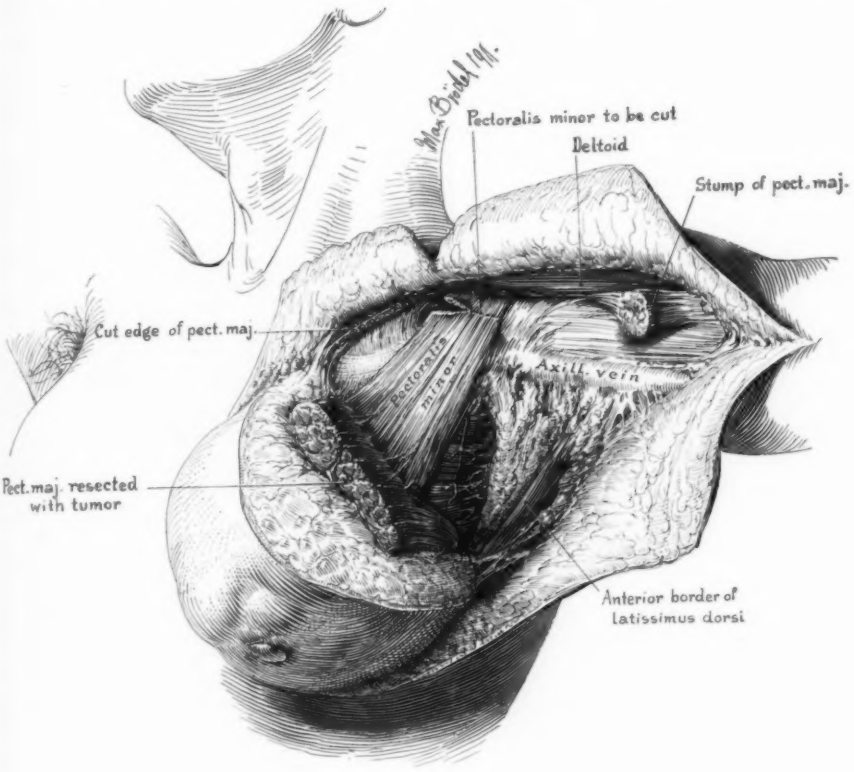


Petit had the advantage of living in a more active period of surgery and having pupils who disseminated and perpetuated his teachings. Certainly his work initiated an uninterrupted trend towards a more satisfactory operation which has culminated in the present radical breast operation. Benjamin Bell, surgeon to the Edingurgh Royal Infirmary, perpetuated, in all essential details, Petit's views in his system of surgery published in 1784; Joseph Pancoast in the United

States extended them, and in 1852 emphasized that the breast and axillary glands, if involved, should be removed in one piece. Charles H. Moore of the Middlesex Hospital, in his paper before the Royal Medical and Chirurgical Society in London in 1867, added to the operation by urging a more complete removal of the breast and the skin covering it and a wide removal of tissues, including axillary glands, if involved or approached by the disease. By some Moore is hailed as the founder of the modern breast operation, but there are good reasons for not agreeing with this opinion. Three years after Moore, Joseph Lister, the founder of antiseptic surgery, supported and extended Moore's teaching. He was probably the first to expose the axilla by division of the pectoral muscle in cancer of the breast and must, therefore, have been the first to perform an adequate axillary dissection. There followed a rapid succession of events of great importance in the development of the modern operation, due in part to more careful studies in microscopic pathology. Volkmann in 1875 contributed the next progressive step when he advocated the routine complete removal of the breast, axillary dissection, and excision of the pectoral fascia. It is rather essential to note his routine or invariable removal of these structures rather than their removal when implicated or approached by the disease, for he frequently found the fascia microscopically involved by the disease when this could not be seen with the naked eye. Volkmann's method became widely accepted. Heidenhain confirmed Volkmann's observations and extended them, for he found microscopically that cancer did not always stop at the fascia but frequently extended along the vessels and lymphatics into the spaces between the fibers of the pectoral muscle. He was led, therefore, to recommend the extension of Volkmann's operation to include the removal of the superficial layer of the pectoral muscle and, in cases in which the cancer was attached to it, the removal of the entire muscle.

The operation for mammary cancer had reached this stage in its development when Dr. Halsted became interested in it. A review of the results of operation showed that when the breast alone was removed—the early type of operation—only 5 per cent of the patients operated upon were free from the disease three years after operation, and 95 per cent died of recurrent cancer; when the breast was completely removed and an axillary dissection carried out in the majority of cases—the next forward step—18 per cent of the patients were free from the disease three years after operation, and 82 per cent had a recurrence; when to this operation was added the removal of the pectoral fascia and sometimes parts of the major pectoral muscle, 20 per cent of the patients were free from the disease three years after operation and 80 per cent suffered a recurrence. The arbitrary time limit of three years of freedom from recurrence as an evidence of cure of the disease we now know is far too short, and an undetermined number of patients listed as free from disease in the above figures must later have died of cancer. The outlook for the cure of cancer of the breast, therefore, was not

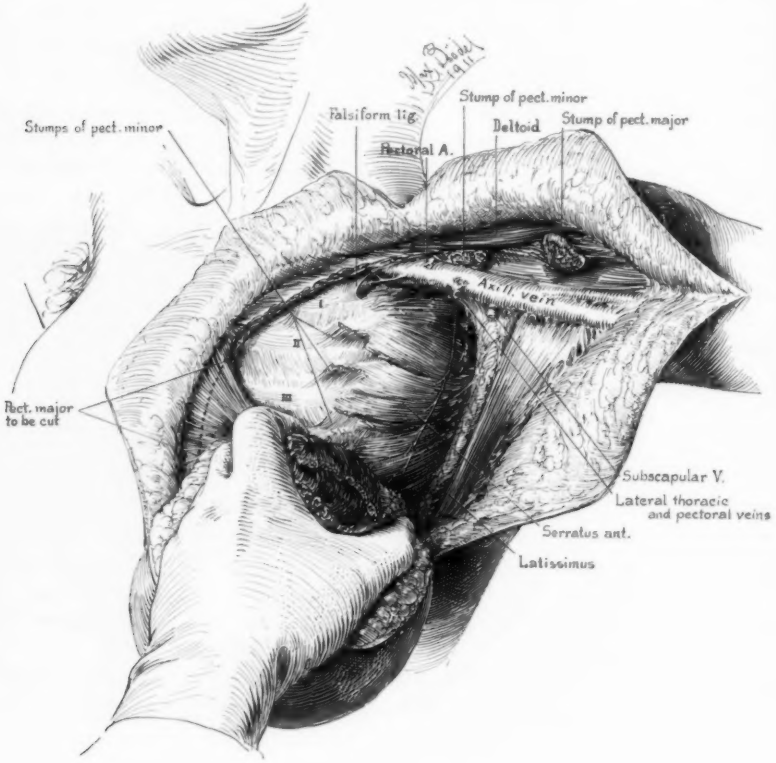
very hopeful when in 1882 Dr. Halsted began his manner of dealing with it. To devise an operation so extensive, so complete and so meticulously performed as to prevent local recurrences within the field of operation and so effect a higher percentage of cures was to him the essence of the problem. He added to the operations of those who preceded him a wider removal of the skin about the involved area, a more extensive reflection of skin flaps to secure more complete



exposure of underlying structures, the *routine* removal of the entire pectoral major muscle except its clavicular portion, and a wider exposure and more meticulous dissection of the axilla by division of the minor pectoral muscle.

Purely from the viewpoint of the historical development of the operation for breast cancer his chief contribution is the routine removal of the major pectoral muscle. But it would appear that he contributed something more than this. His ability to recognize cancer with the naked eye, his insistence that the whole

mass—skin, breast, surrounding fat, pectoral muscle, axillary glands and fat—be removed in one piece or bloc, his invariable practice never to cut into the cancer except when accurate diagnosis required it, and never, if possible to avoid it, to cut across the known extensions of the disease for fear of disseminating it, his extraordinary care and time-consuming exactness in every step of the operation which he handed on to his pupils, all these contributed in no



small measure to the success of the operation. His results, according to the criteria applied by various surgeons, rose from 20 per cent to 45 per cent of five-year cures, and have been since raised to 72 per cent when the disease has been treated before the axillary glands have become involved. He modified his operation from time to time. As first described, he left a large wound which was allowed to heal under a moist blood scab. Later it was covered with large skin grafts. He modified the primary incision so as to avoid a scar on the arm and

across the axilla. He paid more attention to the reconstruction of the axilla so as to prevent the swelling of the arm after operation; and he routinely removed, instead of dividing, the pectoralis minor muscle. He arrived, he often stated, quite independently at the removal, rather than the division of the minor pectoral muscle, but he did not publish this step in his early papers. On the other hand, Willy Meyer, who published his operation very soon after the appearance of Dr. Halsted's paper, did so, and to him is given the credit for this step in the surgery of breast cancer. With these additions and modifications the operation for cancer of the breast became stabilized as far as its principles, extent and method are concerned. Various surgeons from time to time have indeed modified it in some detail; but essentially the radical breast operation of today, which is accepted the world over as the Halsted breast operation, is as he devised it. The benefits he conferred upon women with this dread disease are now beyond estimation; and had Dr. Halsted done nothing more in his lifetime, his name would have remained famous in the annals of medicine.

The story of the surgical treatment of hernia or rupture is, like that of cancer of the breast, of great interest to the student of medicine. Again it cannot be presented in detail; but like cancer of the breast it is a condition which has been known throughout all medical history and has challenged the best efforts of physicians and surgeons to effect its cure. Indeed the distinguished surgeon, William F. Bull, a contemporary of Dr. Halsted's after studying the results of operations for hernia then practiced by himself and other surgeons, declared that the use of the word "cure" in speaking of the results of operative treatment should be abandoned and the results measured by the period of relief before recurrence took place. This was, perhaps, too gloomy a statement, but it conveys an idea of the discouragement of surgeons at the time. Actually up to about 1890 the experience of the best surgeons was that about 40 per cent of the patients subjected to operation had a return or recurrence of the condition within a year of operation, while about 7 per cent of the patients died as a direct result of the operation. It was known that with the operations then practiced the incidence of recurrence increased with the lapse of time; and Bull found in his own series of 136 cases that only four patients remained without a recurrence at the expiration of four years.

The surgical treatment of hernia, then, must have been a real challenge and a subject worthy of the best efforts of any young surgeon, not only because of the failure of previous efforts, but because of the frequency of the condition and the discomfort, disability and danger with which it is associated. In attacking the problem Dr. Halsted's prolonged interest and training in anatomy must have helped him greatly, for he had made careful dissections of the region involved in his courses with his New York students. At a meeting of the Johns Hopkins Medical Society, on November 4, 1889, he presented five patients operated upon for inguinal hernia by a new method. In devising it Dr. Halsted

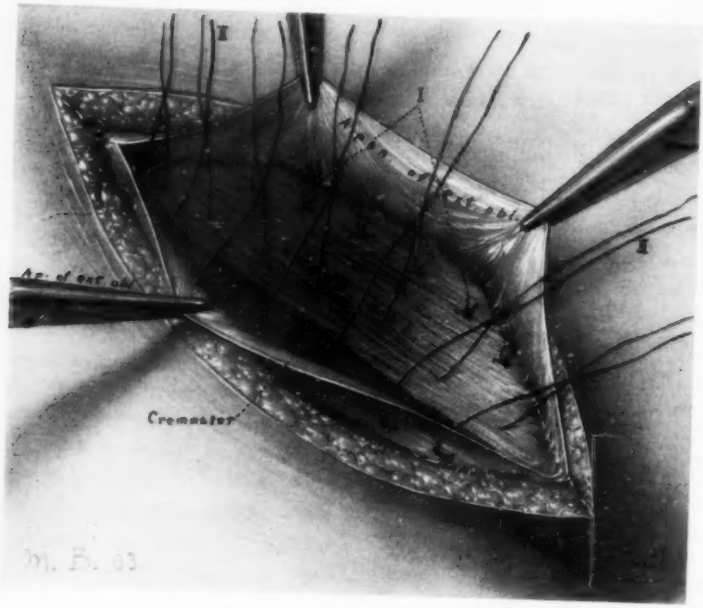
was aware, because he emphasized them, of certain principles or conceptions with respect to the cure of hernia which have remained sound to the present day. These are the careful dissection, high ligation, and excision of the hernial sac, the secure closure or repair of the anatomically weak area of the abdominal wall in the inguinal region, and the avoidance of infection of the wound as a postoperative complication. In the closure or repair of the anatomically weak area of the abdominal wall he insisted upon the approximation of the muscles and fascia to Poupart's ligament without tension and with nonabsorbable (silk) suture material. Furthermore, in the performance of the operation he observed all the meticulous detail of controlling hemorrhage and of avoiding injury to tissues which characterized his surgery. In his first described operation he isolated the hernial sac and closed the peritoneal cavity well above the so-called neck, after which the sac was excised; he carefully freed the vas deferens and vessels of the spermatic cord and transplanted them to the upper outer angle of the operative wound so as to remove them from the weaker area of the abdominal wall. He then repaired the abdominal wall by approximating the muscles and fascia to Poupart's ligament by interrupted strong silk sutures. This brought the spermatic cord through the abdominal wall higher up and well away from its natural point of emergence. The skin and subcutaneous tissues were closed with subcutaneous sutures to prevent infection from the skin. It is interesting how often in the history of medicine, men at great distances apart and quite independently think of the same thing at the same time. Not more than three months after Dr. Halsted announded his operation by the presentation of his small number of cases, Bassini, an Italian surgeon, described a hernia operation which differed from Dr. Halsted's only in one or two minor details. The operation, then, is called by some the Halsted operation, by the majority of surgeons the Bassini operation.

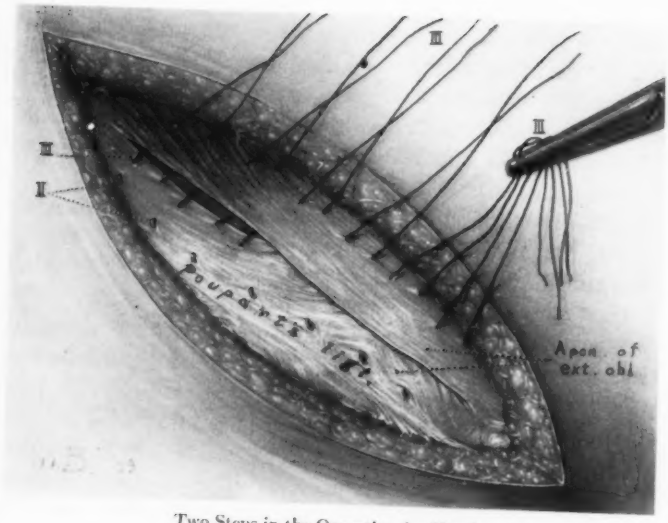
I have noted that in the years up to 1895 Dr. Halsted in his appearances before medical societies or in his published papers discussed hernia many times. His presentations had to do with modifications of his original operation or with studies of the results of operation. The first modification which he described (1892) was the reduction in the size of the spermatic cord in some cases by the excision of some of its veins, in order to lessen the chances of recurrence of hernia at the site of the transplanted cord. Later, in follow-up studies he found that in some cases in which the veins had been excised, atrophy of the testicle occurred and there was a higher incidence of postoperative hydrocele. Therefore, in 1895 he cautioned against the indiscriminate excision of veins of the cord, and abandoned it except in unusual cases. In 1894, he described the substitution of silver wire for silk in the repair of the hernia, hoping to reduce the incidence of infection following operation. The incidence of infection was reduced; but the use of rubber gloves, begun in 1890 and later systematically worn by operator, assistants and nurses, so strikingly reduced the incidence of

infection (1.8 per cent) that silver wire was discarded and the use of silk again resumed. In 1901, and according to Adrian Taylor, in his very first paper on the subject, he reported performing the operation without the transplantation of the cord, and in August, 1903, he published the account of the use of the cremaster muscle drawn up and held under the internal oblique muscle by a series of sutures, a step which he considered important.

The result of these modifications was really the establishment at the Johns Hopkins Hospital of two different operations for hernia: that which has been described which included the transplantation of the spermatic cord, and a second which did not include the transplantation of the cord. The latter, very briefly described, consisted in the high ligation and excision of the hernial sac and the repair of the weak area in the abdominal wall by a series of steps which overlapped the structures of the region from within outward and which included in proper order the bringing of the cremaster muscle under the lower edge of the internal oblique muscle, the approximation of the internal oblique muscle and conjoined tendon to Poupart's ligament, and the overlapping of the fascia of the external oblique muscle. The spermatic cord was left at its natural point of emergence at the lower angle of the wound. The skin was closed as in the first operation. With increasing experience it was found that of the two varieties of inguinal hernia, the indirect or more common inguinal hernia could usually be cured without the transplantation of the cord, while the direct inguinal hernia, which was much more difficult to cure, required not infrequently the operation with transplantation of the cord. Thus the practice became established at the Johns Hopkins Hospital to employ Dr. Halsted's first operation with transplantation of the cord for the direct inguinal hernia, and to employ his second operation without transplantation of the cord for the indirect inguinal hernia. The final addition to the hernia operation which Dr. Halsted developed was the use of a flap of the anterior sheath of the rectus muscle, which was reflected downwards and outwards over the weak area of the abdominal wall and sutured to Poupart's ligament. This he thought would still further strengthen the abdominal wall, particularly in the direct hernia, which recurred more frequently than did the indirect hernia.

This, in short outline, is the story of Dr. Halsted's contribution to the treatment of hernia. In telling it there has been no intention to disregard or underestimate the contributions of others to this important subject. The point which is important to remember is that the ideas and work which led to his contributions were his own, conceived and carried out without knowledge of the work of others. They furnish another example of his approach to a problem, his persistence in arriving at a satisfactory solution, and his honesty in estimating the value of his work. The studies of Bloodgood at the Johns Hopkins Hospital showed that between the years 1889 to 1918, 2486 individuals were operated upon for hernia with a total mortality of seven tenths of one per cent. Of 2230





Two Steps in the Operation for Hernia

patients with indirect hernia, 94.4 per cent were cured and 5.6 per cent suffered a recurrence; of 256 patients with direct hernia, 82 per cent were cured and 18 per cent had a recurrence. These figures are striking in comparison with the results in the treatment of hernia at the time Dr. Halsted became interested in the subject. They have been bettered by some of his pupils who, using the same methods but profiting from his experience, have more advantageously selected cases for given procedures, and have by better techniques lowered the total incidence of infection. The importance of postoperative infection is shown in the Johns Hopkins Hospital cases. In all operations for hernia which healed by primary union, there were only 4.1 per cent recurrences; in operations followed by suppuration there were 30 per cent recurrences.

There remains to be discussed in this period Dr. Halsted's contributions to the treatment of tuberculosis. It had become common in medical thinking to consider tuberculosis of the lungs as a medical disease and to consider tuberculosis of the bones and joints, of the glands, and of the internal organs such as the kidneys, as surgical diseases. In the former, surgery was considered inapplicable and medical treatment offered the better prospect of dealing successfully with the disease; in the latter, surgery was thought superior because it could by operation remove at once a portion of the diseased bone, excise a joint, or remove glands and internal organs. It is difficult to estimate the effect of the separation of the disease into medical and surgical tuberculosis upon the development of the treatment of tuberculosis. But it is certain that the idea that an individual who presents a focus of disease in glands or bones and joints could successfully be treated solely by the surgical removal of the diseased focus was an erroneous one; for follow-up studies showed that individuals were not cured of their tuberculous disease even though their local foci of disease were successfully treated. One of the early reports came from Kocher's clinic in Berne which showed that in individuals with tuberculosis of the glands of the neck subjected to operation, the results so far as the glands of the neck were concerned were good, but almost 30 per cent of the individuals later died of tuberculosis. Reports of the surgical treatment of other forms of tuberculosis showed similar results; and it became evident to students of the disease that surgery alone could not be relied upon to deal successfully with the various conditions grouped under the term surgical tuberculosis. The story of the development of the treatment of tuberculosis of the lungs has been widely described in books, in non-professional magazines and the press. In this country Dr. Trudeau, a contemporary of Dr. Halsted's, established his first sanatorium in the Adirondacks in 1884 and based his treatment upon fresh air and adequate food and rest, a discipline or mode of life which is effective in the cure of early cases. To this regimen have been added certain surgical procedures including compression of the involved lung by artificial pneumothorax or by thoracoplasty, and under particular circumstances by excision of the diseased parts of

the lung. These surgical procedures have greatly improved the treatment of pulmonary tuberculosis, but it must be recognized that they form a part of a general plan of treatment and are not to be considered curative in themselves.

The surgical treatment of tuberculosis in other organs is less generally known. The very magnitude of the problem has made it difficult. Each of the many manifestations of the disease—its involvement of the skin, the bones and joints, the tendon sheaths, the lymphatic glands, the kidney, bladder and generative organs, the intestinal tract, the serous surfaces of the body such as the meninges, pleura, peritoneum—constitutes a problem in relation to the individual as a whole. I have indicated that the surgical removal, when feasible, of a focus of disease does not necessarily solve the problem for the individual who harbors it. The realization of this brought a new concept to the therapeutics of surgical tuberculosis. It was the antithesis of the idea that a direct attack upon the focus would cure the individual; for it postulated that if the individual could successfully be treated for tuberculosis, the focus would heal spontaneously and without operation. Certain men, interested in this conception, began systematically to treat surgical tuberculosis without operation by means of sunlight, rest, fresh air and good food. Of the men concerned in this form of therapeutics, Rollier first comes to mind. An assistant to Kocher in Berne, he found it necessary to give up his career in Berne because of illness in his family and went to the small mountain village of Leysin in Switzerland. There he established in a Swiss chalet a little sanatorium for the treatment of surgical tuberculosis by heliotherapy. In the succeeding years the institution grew to enormous proportions, and Leysin became and still is a Mecca for patients from all over the world. Similar institutions arose in other countries on the continent, in England, and in the United States; and there was established at the Cincinnati General Hospital, through the generous support of Mr. and Mrs. Charles Taft, a heliotherapy unit of 40 beds which I conducted for nearly ten years. The conception that foci of disease as presented in surgical tuberculosis can be healed without operation and by treating the individual conservatively has been proved to be correct; but as a method it has not yet been universally accepted or adopted. There are orthopedic surgeons who assert that rarely if ever is a movable structure, such as a joint, cured by this method; that a cure can be achieved only through ankylosis of the joint secured by operation or produced spontaneously in the course of healing. It has been found, as in all therapeutic efforts, that there are limitations to the method; that some forms of surgical tuberculosis respond favorably whereas others may be more resistant. Equally important is the economic question since the conservative treatment may require one, two or three years to effect a cure. Some may prefer a stiff joint or even amputation with a satisfactory artificial leg to a year or more of conservative treatment with the possibility of ultimate failure.

In the literature on the development of ideas regarding the treatment of sur-

gical tuberculosis Dr. Halsted's name does not appear. But this is due not to the fact that he did not contribute important ideas, but to the fact that these ideas were buried and remained unknown in the volume of proceedings of the first meeting of the National Association for the Study and Prevention of Tuberculosis (May, 1905). During his New York days and in the period between 1887 and 1895 he discussed on four occasions his experiences with the surgical treatment of tuberculosis of the shoulder, the elbow, the hip and the knee; and it becomes evident in reading these discussions that he was impressed with the tendency of tuberculous foci to heal, that he interfered with them surgically as little as possible, and that he practiced what he termed conservative surgery. For example, in discussing an operation for tuberculosis of the hip in which he removed but half of the head and neck of the bone instead of the entire head and secured healing of the disease with good motion at the hip joint instead of ankylosis, he says: "The case sheds a new light upon the surgery of the hip-joint, proving as it does that not only a useful but functionally perfect joint may be obtained even when one half of the head and neck of the femur have been removed by, approximately, a frontal section. We may therefore attack tuberculosis cases in the early stages in some such conservative way.... If the disease is operated upon early it would probably rarely if ever be necessary to remove the whole head of the femur; and we may find that having removed a part of the disease, the remainder, as in tuberculous peritonitis, may take care of itself the better for having been interfered with and assisted."

His experience with conservative surgery in the treatment of tuberculous disease in bones and joints may well have led to what seems a logical second thought,—to treat them not by operation but by nonoperative conservative measures. Certain it is that the idea was early in his mind, for he began treating surgical tuberculosis by the "open air treatment" with the opening of the Johns Hopkins Hospital. He relates in the paper, long buried, that he first met Dr. Trudeau in 1889 about four years after he had established his sanatorium at Saranac Lake. He (Dr. Trudeau) "eagerly welcomed the suggestion that possibly all cases of tuberculosis, irrespective of the lesion, might be benefited by the treatment which he believed was proving to be of great value for pulmonary tuberculosis. The milder the case, or in other words, the more nearly perfect the patient's immunity, the greater, presumably, was the prospect of cure. Hence cases of bone and lymph gland tuberculosis which under various names, had for ten centuries been regarded as more or less curable and certainly as infinitely less to be dreaded than 'consumption' seemed eminently proper ones for the open air treatment."

Although he treated surgical tuberculosis by open air methods on the "bridge" of the Johns Hopkins Hospital, a year was to pass after Dr. Halsted's talk with Dr. Trudeau "before the patient destined to be the first to make the true experiment in the treatment of surgical tuberculosis presented himself."

He consulted Dr. Halsted in 1890, was found to have Pott's disease with sinuses and an enormous waxy liver, and to be in a desperately serious condition. He was transported to Saranac Lake in a private car, was restored to fair health, married, was the father of three children, and lived twelve years, dying then of Bright's disease. There followed ten other cases. Dr. Halsted waited fifteen years after his first case before speaking or writing on the subject, partly in order to accumulate a sufficient number of cases, partly to allow a sufficient time to elapse to make his report convincing. This report he made at the first meeting of the National Association for the Study and Prevention of Tuberculosis. A study of his eleven cases shows that three patients aged fifteen, twenty-eight and thirty-eight years had tuberculosis of the hip joint; 2 aged twenty-five and twenty-eight years had tuberculosis of the knee joint; 2 aged sixteen and seventeen had tuberculosis of the glands of the neck; 2 had tuberculosis of the bladder, and one each had tuberculosis of the spine and of the sacroiliac joint. In the three patients with tuberculosis of the hip the disease was arrested, the function or motion of the hip joint restored practically to normal, and the patients were enabled to resume a normal active life although in one the head of the bone was destroyed; in the 2 patients with tuberculosis of the knee joint similar results were obtained; in the 2 patients with tuberculosis of the glands of the neck the glands disappeared and the patients were well; of the 2 patients with tuberculosis of the bladder one was apparently cured, the other greatly improved over fifteen years; of the patients with tuberculosis of the spine and of the sacroiliac joint, one improved to the extent of leading a fairly normal life for twelve years and one apparently made a complete recovery. It appears, from a study of these cases, that he proved his point,—that cases of surgical tuberculosis may be arrested or cured without operation by following a regimen much like that employed for pulmonary tuberculosis.

In September, 1931, Allen Krause, distinguished student of the subject of tuberculosis and editor of the American Review of Tuberculosis, resurrected the paper embodying the above cases and reprinted it. His editorial introduction is interesting and instructive and parts of it deserve to be quoted. "One of the present editors' enduring recollections of medical-school days is of a Friday Clinic of Professor Halsted in the year 1906 or 1907. These Friday clinics were famous. Here would crowd in, at noon, the third and fourth year students and visitors, to watch presented, usually as surgical problems, cases selected by one of the most critical scientific minds this country has known.

"On this particular Friday 'the Professor' had surrounding him in the pit of the amphitheater a motley crowd of patients whose 'surgical' tuberculosis he had treated by non-operative methods. For the most part he had supervised their management in cooperation with Trudeau. For almost 15 years the two men had worked together. The results at the time seemed little short of miraculous. By means of non-interference perfect function had frequently been obtained, and the editor has a distinct recollection of Halsted's statement of how,

through and because of fresh air treatment, some adolescent patients with joint diseases would come through without atrophy and without shortening, as well as without diminution of function.

"More than a decade went by before we in America again began to hear much about the treatment of nonpulmonary tuberculosis by another nonsurgical procedure (heliotherapy). In essentials the results differed hardly at all from those announced by Halsted many years before. There was, however, an important difference of opinion as to the effective force or factor in treatment. Following the established canons of his day Halsted ascribed to "fresh air" the healing moment of his method. It could hardly be otherwise at a time when rest took on but minimal proportions compared with current concepts of today, and when it was by all odds the shortest and weakest leg of the canonical tripod of phthisiotherapy,—fresh air, food (superalimentation) and rest. . . .

"As the vogue of heliotherapy and ultravioletism grew to a furore . . . the editor, mindful of Halsted's earlier attempts and ideas, awaited in vain the mention of his pioneer efforts and some references to them by way of criticism of the alleged victories of sunlight and ultraviolet rays. But, to the editor's knowledge, no citation of Halsted's work has ever appeared in this connection. More,—inquiry of many men over a period of some years has disclosed that not a man interrogated knew that Halsted had published a word on the treatment of tuberculosis.

"Now Halsted's paper is surely a classic, just as it is a trail-breaker, on the subject, —on the management of surgical tuberculosis by noninterference. At the time, Halsted's experience and suggestions fell on sterile ground. We can hardly imagine any surgeon of 1905, schooled in the rigid precepts of excising and fixing tuberculous joints, as ready to spend several years in expectant waiting for arrest and cure of these diseased joints. Have we indeed advanced much further today? Within the last month the editor has seen a letter in which an orthopedist of the first distinction states categorically that never in his experience has he observed a 'functional result' in the case of tuberculosis of the knee in an adult unless an arthrodesis had been done. This man might profitably be referred to Halsted's case III in the paper that follows.

"Which brings us to the main reason for reprinting this classic of tuberculosis by Halsted: to drag from oblivion an account, served to the medical world years before its time, of how tuberculosis, in forms that had always seemed predestined to the knife, would yield, as surely as pulmonary tuberculosis, to time and expectant care; to put on record afresh, and with more timeliness, results that will compare not unfavorably with those now being attributed to another more specific agent by a large body of opinion that still has its thesis to prove scientifically; to present anew old material to encourage and aid us in keeping alive the spirit that calls without ceasing for revaluations of the causes of tuberculosis and the means of healing it."

It will be seen that Dr. Krause draws a distinction between the nonsurgical

methods of Halsted and those, for example, of Dr. Rollier. Dr. Halsted treated his patients by a regimen of fresh air, adequate food, and rest; and of these he emphasized fresh air and insisted that whenever possible his patients spend the entire twenty-four hours of the day out of doors. The question which of Dr. Krause's "canonical tripod"—fresh air, food and rest—was the effective factor in healing tuberculosis greatly interested Dr. Halsted for many years. Much later in his life, when I was associated with him, he frequently referred to the subject and stated that it must be *cold* air which is the effective agent. This is an interesting conclusion in view of subsequent observations; for it has been shown that exposure to cold air raises, and maintains at a high level, the metabolic activity of the individual. Dr. Halsted did not emphasize sunlight or heliotherapy as an important adjunct to conservative treatment, although his patients on the "bridge" of the hospital were in part exposed to it. On the other hand, throughout the ages heliotherapy has been believed to be an effective remedy for disease. The Egyptians, the early Biblical peoples, the Greeks and the Romans all utilized the sunlight for the treatment of disease. Celsus in the first century and Galen shortly afterward recommended sun baths for various conditions. Antyllus, the Roman surgeon, treated such conditions as rickets by massage in the sun, emphasizing the value of pigmentation of the skin. The physicians of the Middle Ages, Avicenna and Henri de Mondeville, used heliotherapy and phototherapy as methods of treatment. But it was not until later that the systematic treatment of specific conditions by heliotherapy received serious consideration. About 1840 Ollier and Poncet of Lyons published their observations on the treatment of tuberculosis of the joints by sunlight. Rickli of Switzerland, although not a physician, established a clinic at Veldes, Austria, and in 1855 published his article on "Le Cure Atmosphérique" in which he recorded surprising results. In 1902 Bernhard of St. Moritz, impressed by the Swiss butcher's custom of curing meat by sunlight, treated the infected and suppurating wound of a patient by exposure to the direct sunlight. Healing was so remarkable that other wounds were similarly treated, and soon afterward he published his paper on surgical conditions treated by exposure to the sunlight. Ignorant of Bernhard's work, Rollier in 1903 began treating patients with surgical tuberculosis by heliotherapy at Leysin; and with him may be said to have begun the sanatorium treatment of surgical tuberculosis by heliotherapy.

In England in 1908 the Trelvar Home for Crippled Children at Alton was established with Sir Henry Gauvain, a disciple of Rollier, in charge; in America the first institution to be built was the J. N. Adam Memorial Hospital at Perrysburg, New York, through the enthusiasm and faith in the method of Dr. John H. Pryor. By those in charge of these and similar institutions, sunlight is given first place as the therapeutic agent in the cure of surgical tuberculosis; but it is certain that fresh air, its natural accompaniment, and rest and food are important elements in treatment. At the present time the specific role of each

of the various factors concerned in the nonoperative or conservative treatment of surgical tuberculosis cannot be stated; and even the distinguished heliotherapeutist, Sir Henry Gauvain, expresses some doubt as to the relative value of cold air and heliotherapy in treatment. Dr. Halsted, without emphasizing heliotherapy, achieved results comparable with those obtained in institutions devoted to heliotherapy; and yet one cannot have visited and studied the results at Leysin, Alton, England, and Perrysburg, or have had ten years' experience in the use of the method without being convinced that heliotherapy is an effective agent which builds up the physique of the individual, stimulates and maintains his muscular tone, influences his morale and his mental reaction to his disease, and hastens and consolidates his cure.

So long an account of this subject is scarcely justified, and yet it appears necessary in order to place Dr. Halsted's idea and work in their proper relationship with the development of the treatment of surgical tuberculosis. Beginning his plan of treatment in 1889 and definitely formulating a sanatorium regimen of noninterference in surgical tuberculosis in 1890, he antedated, as far as I can determine from any published reports, anyone in America in the nonoperative treatment of tuberculosis and antedated Rollier's sanatorium treatment by heliotherapy by some thirteen years. He must be accorded, therefore, a prominent, if not the most prominent place in the development of this form of treatment of surgical tuberculosis.